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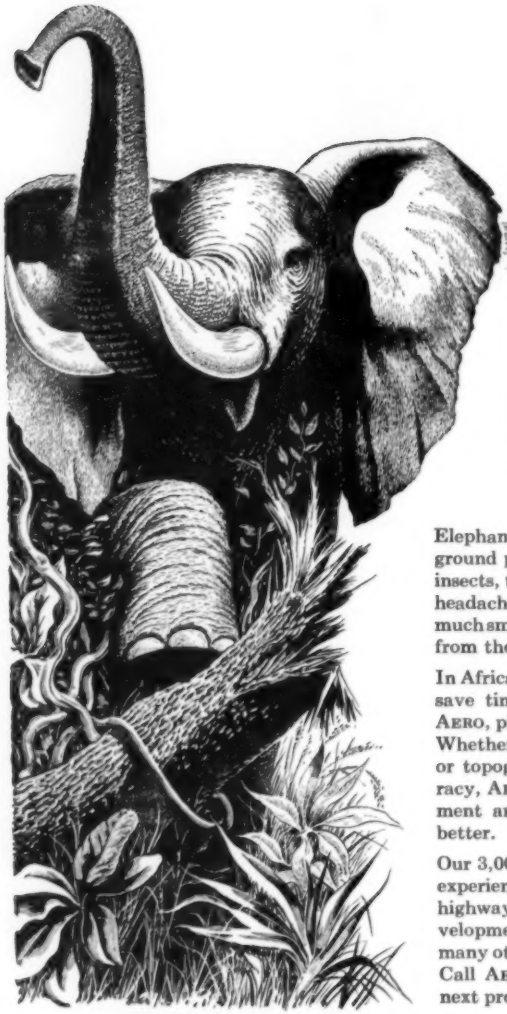

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Howard S. Rappleye,

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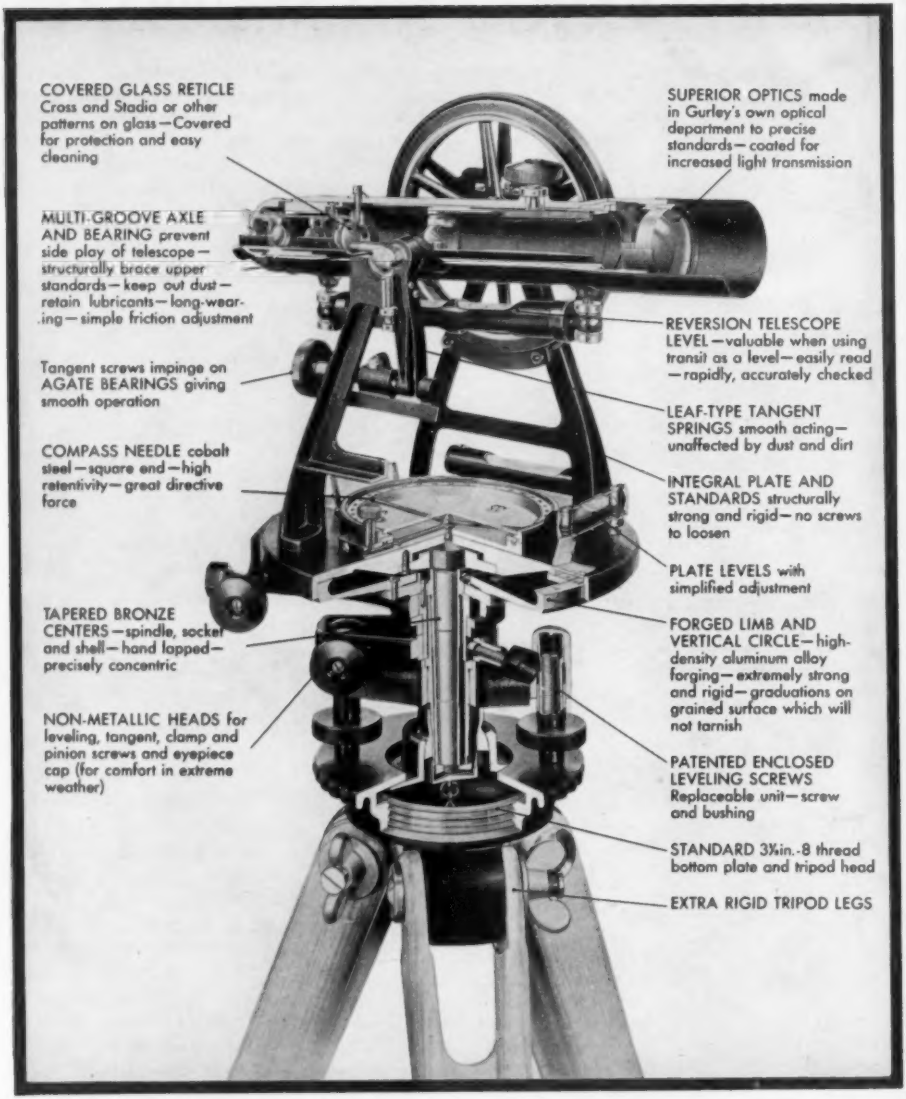
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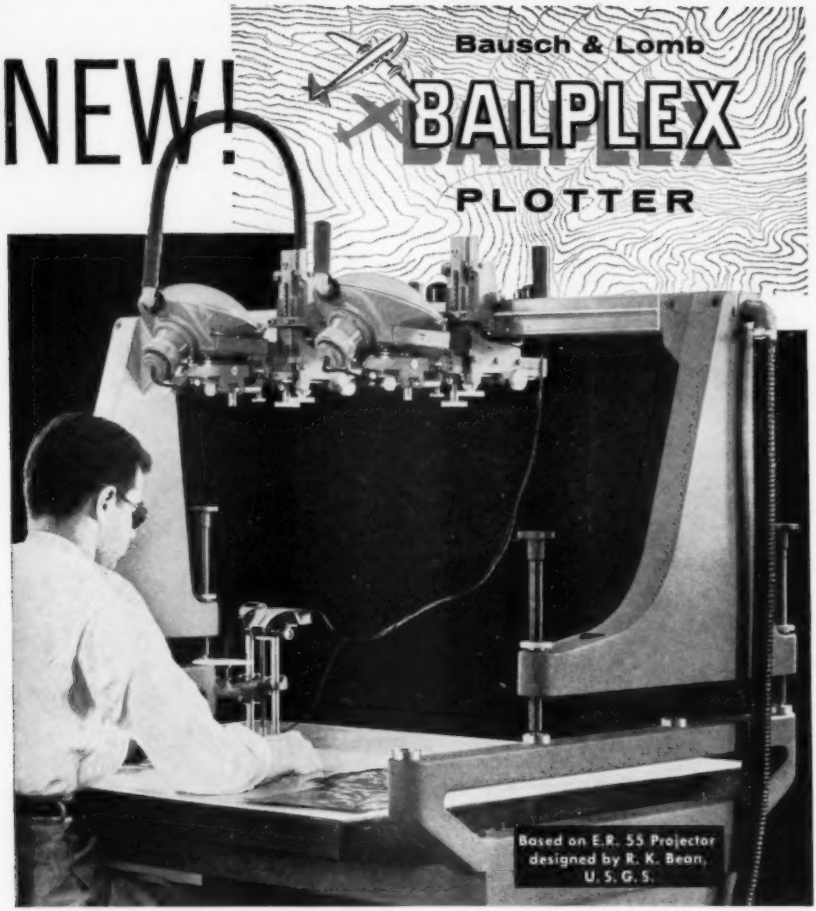

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State Laws Defining Land Surveying

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SECRETARY, PROPERTY SURVEYS DIVISION, ACSM

ALABAMA

"The term 'land surveyor' as used in this Chapter shall mean a person who engages in the practice of land surveying as hereinafter defined. The practice of land surveying within the meaning and intent of this Chapter includes surveying of areas and underground mine workings for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof." [1]

ARIZONA

" 'Land Surveyor' shall mean a person who engages in the practice of surveying tracts of land for the determination of their correct location, areas, boundaries, and description, for conveyancing and recording. or for establishment or re-establishment of boundaries and the plotting of lands and subdivisions."

CALIFORNIA

"A person practices land surveying within the meaning of this chapter who, either in a public or private capacity, does or offers to do any one or more of the following:

(a) Locates, relocates, establishes, reestablishes, or retraces any property line or boundary of any parcel of land or any road, right of way, easement, alignment or elevation for any of the fixed works embraced within the practice of civil engineering, as described in Chapter 7, Division 3 of this code.

(b) Makes any survey for the subdivision or resubdivision of any tract of land.

(c) By the use of the principles of land surveying determines the position for any monument or reference point which marks a property line, boundary or corner, or sets, resets or replaces any such monument or reference point.

(d) Determines the configuration or contour of the earth's surface or the position of fixed objects thereon or related thereto, by means of measuring lines and angles, and applying the principles of trigonometry.

(e) Geodetic or cadastral surveying.

(f) Determines the information shown or to be shown on any map or document prepared or furnished in connection with any one or more of the functions described in subsections (a), (b), (c), (d), and (e).

(g) Indicates, in any capacity or in any manner, by the use of the title 'Land Surveyor' or by any other title or by any other representation that he practices or offers to practice land surveying in any of its branches.

(h) Procures or offers to procure land surveying work for himself or others.

(i) Manages, or conducts as manager, proprietor, or agent, any place of business from which land surveying work is solicited, performed or practiced."

(Amended 1941)

CONNECTICUT

"The practice of Land Surveying means that branch of engineering and applied mathematics which includes the surveying and measuring the area of any portion of the earth's surface, the lengths and directions of the bounding lines, the contour of the surface, for their correct determination and description and for conveyancing or for recording, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof; and like measurements and operations involved in the surveying of mines."

DELAWARE

"The practice of land surveying within the meaning and intent of this Act includes

[1] Applicants, on examination, must be familiar with elevations, profiles, and trigonometric leveling.

all land surveying, surveying of areas for the correct determination and description, and for conveyancing, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions thereof; also, grades for buildings, ditches, roads, sewers, etc., or same as now being done by land surveyors."

GEORGIA

"The practice of land surveying within the meaning and intent of this Act includes surveying of areas of the earth surface for their correct determination and description and for conveyancing, and recording, or for the establishment or re-establishment of land boundaries and the plotting of land and subdivisions thereof."

IDAHO

"The term 'Land surveyor' means an engineer who engages in the practice of land surveying, but does not practice any other line of engineering, and whose license is limited to land surveying. The term 'land surveying' includes responsible supervision of surveying of areas for their correct determination and descriptions and for conveyancing, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions thereof."

ILLINOIS

"Any one or any combination of the following practices constitutes the practice of land surveying:

(1) Surveying and measuring the area of any portion of the earth's surface, the lengths and directions of the boundary lines, and the contour of the surface for their correct determination and description, and for conveyancing or for recording or for establishing or reestablishing, locating, defining and making or monumenting land boundaries or lines and the platting of lands and subdivisions thereof; or

(2) Preparing and vouching for the accuracy of a map or plat showing such land boundaries or lines and the marks and monuments thereto, or map or plat of a subdivision or partition of land for the purpose of making the same an instrument of public record; or

(3) Executing and issuing plats establishing one or more corners or boundaries of any tract or lot of land and signing therefor as a surveyor."

IOWA

"The practice of 'land surveying' within the meaning and intent of this chapter includes surveying of areas for their correct termination and description and for conveyancing, or for the establishment or reestablishment of land boundaries and the platting of lands and subdivisions thereof." [2]

LOUISIANA

"The term 'Land Surveyor' as used in this Act shall mean a person who engages in the 'Practice of Land Surveying' as hereinafter defined.

"The 'Practice of Land Surveying' within the meaning and intent of this Act includes measuring of areas, land surfaces, streams, bodies of water and swamps for their correct determination and description, for the establishment, re-establishment, ascertainment or description of land boundaries, corners, divisions, distances and directions, the plotting and monumenting of lands and subdivisions thereof, and mapping and topographical work."

MARYLAND

"The practice of land surveying within the meaning and intent of this Article includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or reestablishment of land boundaries and the plotting of lands and sub-divisions thereof. The plotting of lands and sub-divisions may include topography and contours, setting grades and determining drainage of streets and roads, and providing for small drainage structures."

MICHIGAN

"The practice of land surveying within the meaning and intent of this act includes

[2] Act specifically excludes topography from land surveying.

surveying of areas for their correct determination and description and for conveyancing, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions thereof."

MINNESOTA

"Any person shall be deemed to be practicing land surveying within the meaning of Sections 326.02 to 326.16 who makes any survey for the establishment or re-establishment of land boundaries, or for the subdivision and platting of land or for the determination of areas." [3]

MONTANA

"The term 'Land Surveyor' when construed by the Board shall mean a person who engages in the practice of land surveying as hereinafter defined.

"The term 'Practice of Land Surveying' when construed by the Board shall mean the surveying of areas for their correct determination and description and for conveyancing, or for the establishment of re-establishment of land boundaries, and the plotting of lands and subdivisions thereof."

NEVADA

"A person practices land surveying within the meaning of this act who, in a private or public capacity does or offers to do any one or more of the following:

(a) Locates, relocates, establishes, reestablishes, or retraces any property line or boundary of any tract of land or any road, right-of-way, easement, alignment, or elevation of any of the fixed works embraced within the practice of professional engineering as described in Section 2 of the engineer's registration law.

(b) Makes any survey for the subdivision or resubdivision of any tract of land.

(c) By the use of the principles of land surveying, determines the position of any monument or reference point which marks a property line, boundary or corner, or sets, resets, or replaces any such monument or reference point.

(d) Determines the configuration or contour of the earth's surface or the position of fixed objects thereon or related thereto, by means of measuring lines and angles, and applying the principles of trigonometry.

(e) Geodetic and cadastral surveying.

(f) Municipal and topographic surveying.

(g) Determines the information shown or to be shown on any map or document prepared or furnished in connection with any one or more of the functions described in subsections (a) (b) (c) (d) (e), and (f).

(h) Indicates in any capacity or in any manner, by the use of the title 'Land Surveyor,' or by any other title or by any other representation that he practices or offers to practice land surveying in any of its branches.

(i) Procures or offers to procure surveying work for others, or for himself.

(j) Manages or conducts as manager, proprietor, or agency, any place from which land surveying is solicited, performed, or practiced.

(3) Surveys made exclusively for geological or landscaping purposes, or aerial photograph or photogrammetry, and not involving any of the practices specified in subsection 2 of this section do not constitute land surveying within the meaning of this act.

(4) Surveys authorized under this act do not include the design, either in whole or in part, of any structure or fixed works embraced in the practice of professional engineering, as defined in Section 2 of the engineers registration law."

NEW JERSEY

"The practice of land surveying within the meaning and intent of this Chapter includes surveying of areas for their correct determination and description and for conveyancing, and for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions thereof, and such topographical survey and land development as is incidental to the land survey."

[3] Applicants are examined on topographic surveying.

NEW YORK

"A person practices land surveying within the meaning and intent of this article who surveys areas for their correct determination and description, and for conveyancing, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions thereof." [4]

NORTH CAROLINA

"The term 'Practice of Land Surveying' within the meaning and intent of this Act includes surveying of areas for their correct determination and for conveyancing, or for the establishment or re-establishment of land boundaries or for the plotting of lands and subdivisions thereof, or the determination of elevations and the drawing descriptions of lands or lines so surveyed." [5]

OHIO

" 'Practice of Surveying' means that branch of engineering and applied mathematics which teaches the art of surveying and measuring the area of any portion of the earth's surface, the lengths and directions of the bounding lines, and the contour of the surface, for their correct determination and description and for conveyancing, for recording, or for the establishment or reestablishment of land boundaries and the plotting of lands and subdivisions; and like measurements and operations involved in the surveying of mines, commonly known as 'Mine surveying'." [6]

PENNSYLVANIA

" 'Practice of Surveying' means the practice of that branch of the profession of engineering which makes surveys for the determination of area, and for the establishment or reestablishment of land boundaries and the subdivision and plotting of land, and who makes surveys for the establishment of lines, grades or elevations for carrying out engineering work, and who, in connection therewith, determines quantities of materials and prepares plans or specifications for minor work not involving safety to life or health, and who determines quantities or who make estimates for proposed work, or for work under construction, or work that is completed, or who, in addition to the foregoing, makes estimates of quantities of mineral or minerals in place, or that have been removed."

PUERTO RICO

"Licensed surveyor.—Means any person who by virtue of his special knowledge of physics and mathematics and of the principles and methods used in surveying, acquired through the learning disciplines and professional experience, is qualified to practice surveying, as defined in subdivision (f) of this section—and as it may be ascertained by the Board through a license issued in his name.

(f) Practice of Surveying—Means:

1. The rendering of any professional service or the doing of any work requiring the knowledge, training and experience of a surveyor as defined in subdivision (d) of this section.

2. The application of the said special knowledge of physics, mathematics and surveying when rendering such professional services required in the realization of any cartographic work, surveying in relation to projects or engineering or architectural works, determinations and descriptions of areas, demarcation and division of lands, and the verification and certification thereof, including graphic representations or designs.

It shall be understood that a person practices or offers himself to practice surveying if, through the use of written or oral words, labels, symbols, drawings or through any other kind of signs by any other physical means, announces himself as a surveyor."

RHODE ISLAND

"The practice of 'Land surveying' within the meaning and intent of this Act includes responsible supervision of surveying of areas

[4] Applicants examined in geodetic and hydrographic surveying.

[5] Permissive law.

[6] Applicants examined in route surveying, profiles.

for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivision thereof."

SOUTH CAROLINA

"The 'practice of land surveying' within the meaning and intent of this Chapter includes surveying of areas for their correct determination and description and for conveyancing or for the establishment or re-establishment of land boundaries and the platting of lands and subdivisions thereof."

SOUTH DAKOTA

"Any person who shall be engaged in locating, establishing, or relocating any land boundary line between two or more landowners, or who shall be engaged in locating any United States government, state, county, township, or municipal land survey lines of any public streets or roads, is hereby declared to be a 'surveyor' and as practicing land surveying within the provisions of this chapter."

VIRGINIA

"Land Surveying refers only to surveys for the reestablishment of land boundaries and the subdivision of land and such topographic works as may be incident thereto, the making of plats and maps and the preparing of descriptions of the land so surveyed or investigated."

WYOMING

" 'Land Surveying' is surveying having to do with the boundaries or areas of tracts of land for their correct determination and description, and for conveying, when that is involved, or for the establishment or re-establishment of land monuments and boundaries and the platting of lands and subdivisions thereof, and making plats, maps and drawings descriptive of the lands or lines so surveyed, platted or investigated, or for other work involving plane surveying and mapping."

TABULAR SUMMARY OF EXPERIENCE REQUIREMENTS, REGISTRATION, AND SPECIAL NOTATIONS

State or Territory	*Experience*[7]	*Registration*[8]
Alabama	6	307
Alaska[9]	8	17
Arizona[14]	—	63
Arkansas[10]	—	—
California[13]	5	665
Colorado[11]	—	104
Connecticut	8	213
Delaware	6	90
Florida[11]	—	262
Georgia	6	912
Hawaii[11]	—	71
Idaho[13]	6	35
Illinois	5	839
Indiana[11 12]	—	100
Iowa	6	37
Kansas	—	—
Kentucky[10]	—	—
Louisiana[13]	6	140
Maine	—	—
Massachusetts	6	442
Maryland	6	154
Michigan	8	271
Minnesota	6	94
Mississippi	—	—
Missouri[10]	—	—
Montana	6	69
North Carolina[12]	5	294
North Dakota	—	—
Nebraska	—	—
Nevada	—	29
New Hampshire	—	—
New Jersey	6	311
New Mexico	—	124
New York	6	964
Ohio	8	1050
Oklahoma	—	—
Oregon	—	256
Pennsylvania[12]	6	553
Puerto Rico	2	271
Rhode Island	6	70
South Carolina	6	212
South Dakota	7	41
Tennessee	—	—
Texas[16]	6	—
Utah	6	102
Vermont[10]	—	—
Virginia[15]	4	325
Washington	6	172
Wisconsin[16]	6	—
West Virginia	—	—
Wyoming	6	393
Total		10,052[17]

[7] Entries in this column indicate the number of years of experience required to be allowed to take the written examination. All states noted allow from two to four years of college toward experience requirements. All but Virginia require at least one year of experience in addition to college. Many states allow oral examination when applicant has 10 years of experience and is over 30 years of age.

[8] Entries in this column indicate the number of surveyors registered, as of June 1953.

[9] Surveyors licensed specifically under "Engineer-specialists" in a major branch of engineering.

[10] Land surveying specifically excluded from requiring a license under the Professional Engineers Act.

[11] Law not available at the time this compilation was made.

[12] Licensed engineers may engage in the practice of land surveying.

[13] Licensed civil engineers may engage in the practice of land surveying.

[14] Licensed civil engineers may engage in the practice of land surveying incidental to engineering project.

[15] Licensed engineers and architects may engage in the practice of land surveying incidental to engineering or architectural projects.

[16] Law passed in 1955.

[17] This total is misleading in many respects as it does not include engineers practicing or licensed to practice surveying, public official exempt by law, permissive registration, or any figures on Texas and Wisconsin. Most States have the same type of exemptions from registration for surveying as for architects and professional engineers, namely, non residents (allowed from 30 to 90 days practice in any one year); employees of registered persons, State, city, county, Federal employees, public utility and interstate employees ALL while ONLY engaged in practice for their employers on land and landed interests of same. It appears that about half of the State now require most of the above in responsible charge to be registered when public health or safety is involved.

Map of Cabin John Watershed Area

A topographic map—scale 1" = 200 feet and 5-foot contour interval—of a 16,000 acre tract, completed in four months at a cost of 85 cents per acre, would have been almost an impossibility in the days before photogrammetric methods came into use. Today such a project seems to be a more-or-less routine operation.

Air Survey Corporation, of Arlington, Va., mapped the Cabin John Watershed Area in Montgomery County, Md., for The Maryland-National Capital Park and Planning Commission, during the period from April to July 1955, to produce the maps required for use in preparing a comprehensive plan for the area. The proposed planning includes subdivision layouts, school and park sites, highways, roads, recommended zoning, commercial and industrial sites, sewer and water line extensions, and airports, if and where necessary.

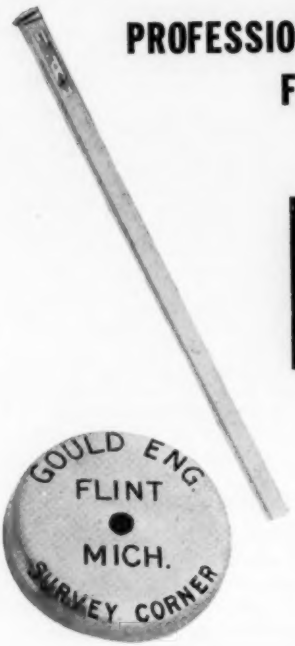
Specifications for the work required photography at a scale of 1:12,000. Horizontal accuracy requirements called for 90% of all cultural features to be located correctly within 5 feet, and none to be in error by more than 10 feet. Vertical accuracy requirements called for 90% of all contour elevations to be correct within one half of the contour interval, and none to be in error by more than a full contour interval—except where swamp growth or forest cover completely obscured the ground, in which cases the tolerances were doubled.

The finished map comprises 16 sheets on which both the Washington Suburban Sanitary Commision and the Maryland State grids are shown. Copies are available from The Maryland-National Capital Park and Planning Commission at prices varying from $1 to $2 per acre, depending on the area covered.

Empire Survey Review

Readers of SURVEYING AND MAPPING may be interested to know that orders and remittances to the *Empire Survey Review* which originate in the United States will be accepted by A. J. E. Davis, Crown Agents Representative, Bradford Building, 1800 K Street, N. W., Washington 6, D. C. The subscription price for subscribers in the United States is 80 cents per copy. *Empire Survey Review* is a quarterly and is published for the Secretary of State for the Colonies by the Crown Agents for Oversea Governments and Administrations, 4 Millbank, London, S.W. 1, England. The arrangement with the Crown Agents Representative in Washington, D. C., makes is unnecessary for United States subscribers to purchase International Money Orders in order to subscribe to or to purchase single numbers of this excellent British journal.

PROFESSIONAL PROPERTY MARKERS FOR PROFESSIONAL SURVEYORS



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ERDL Developments in Plastic Scribing

By Q. S. JOHNSON

ENGINEER RESEARCH AND DEVELOPMENT LABORATORIES

INTRODUCTION

SINCE 1952 the Map Compilation Branch of the Engineer Research and Development Laboratories of the U. S. Army Corps of Engineers has been actively engaged in the development, design, testing, and evaluation of equipment and techniques used in color-separation drafting by the plastic-scribing process. The objectives of these investigations were the adaptation of the proven advantages of the plastic-scribing process to military mapping; and the development of instrumentation, accessories, and supplies used in this process which would meet military requirements of ruggedness, simplicity and ease of operation, and resistance to climatic extremes encountered in field operations.

Initial investigations by the Engineer Research and Development Laboratories confirmed the advantages of the plastic-scribing process, and a prototype set of scribing equipment and accessories was designed for service test by field and base-plant topographic organizations of the Department of Defense. This set, components of which are illustrated in Figure 1, is based on a combination rigid and swivel scribing tool using straight-line points in rigid operation and "gooseneck" offset points for swivel operation. Included as accessories to the basic tools are a pen-type fine-line graver; a variable plastic templet for circles, triangles, and rectangles of various sizes; straight and gooseneck swivel-type steel scribing points including presharpened double- and triple-line swivel points; a screwdriver; and a dust brush for cleaning debris from the scribed sheet. This basic scribing equipment set was supplemented with a set of sharpening jigs and stones designed to produce optimum point angles with a minimum of adjustment in sharpening the hardened (62C Rockwell) steel scribing points. Furnished with the equipment and accessories sets was an adequate supply of vinyl chloride acetate sheeting coated with the formulation of yellow "FloPaque" base scribe-coating paint developed by ERDL, and a correction fluid for use on this coated vinyl.

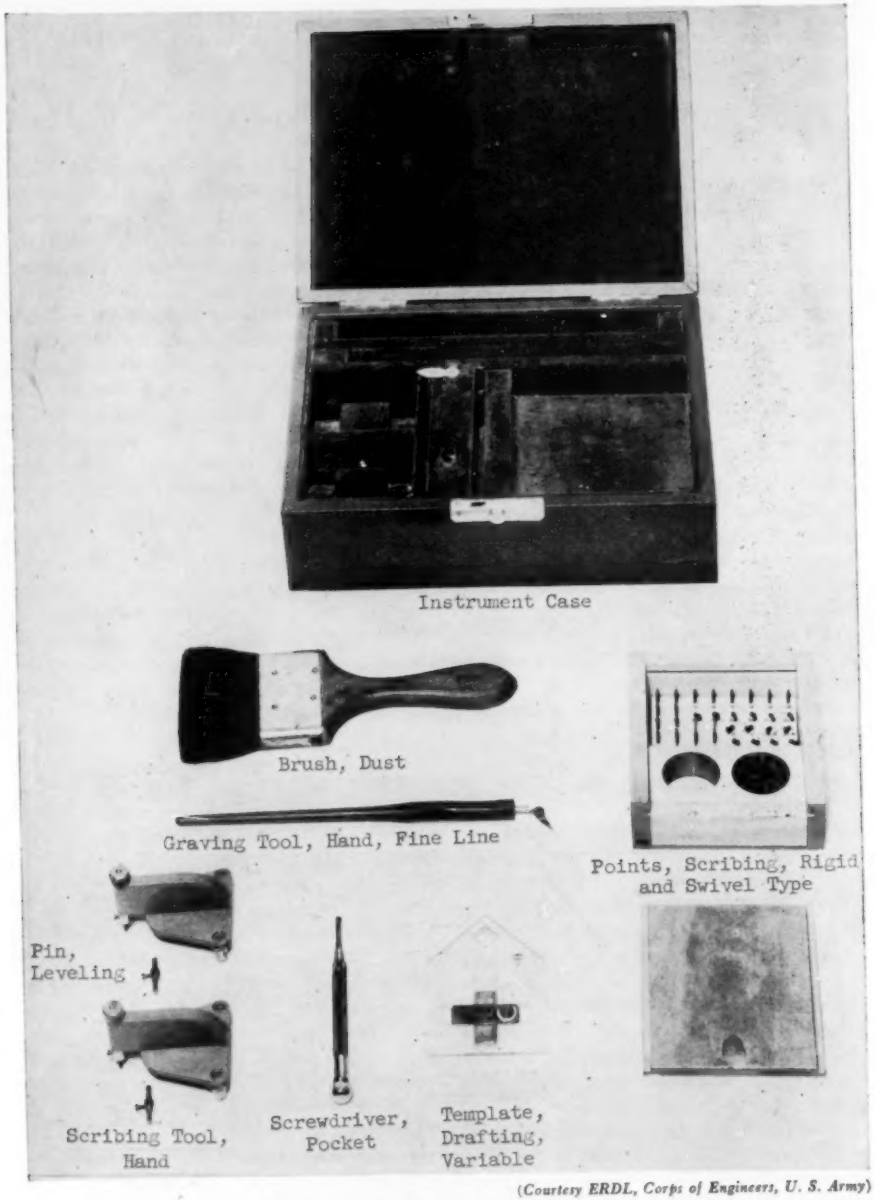
This article covers investigations and developments by these Laboratories since these sets were assembled and includes testing and evaluation procedures used, as well as brief descriptions of new tools, coated plastics, and such accessory items as permanent-type scribing points, swivel attachments, and lettering and symbolization templets.

TESTING

Reports received to date from service test agencies are uniformly enthusiastic in accepting the plastic-scribing process as a major improvement over pen-and-ink color-separation drafting, and uniformly recommend immediate standardization of the method for military use. Many specific recommendations for improvements in instruments, coated plastics, and accessories are included in the reports received from the testing agencies, materially assisting in orienting development effort of the Laboratories.

Objective tests are being conducted by these Laboratories on basic scribing tools, special-purpose scribing tools, fine-line (pen-type) gravers, scribe coatings, plastic bases, scribing points, and symbol templets. These tests, which are continuing as new items are developed by industry, other Government agencies, or ERDL, are designed to provide reliable comparisons of the important measurable characteristics of each item, and include the following:

1. *Climatic Tests.* All items are subjected to − 80° F. for four days, + 80° F. at 100 percent relative humidity for six hours, and + 160° F. for three 4-hour periods to determine resistance to anticipated extreme



(Courtesy ERDL, Corps of Engineers, U. S. Army)

FIGURE 1.—Service test plastic-scribing set.

storage conditions; and are used in scribing operations at + 80° F. and 95 percent relative humidity and at + 125° F. to determine usability at these extremes. Resistance to attack by fungus and vermin in tropical exposures is also determined in these tests.

2. *Coating and Base Performance Tests.* Those important performance characteristics of base plastics and scribe coatings for which quantitative evaluation tests were designed and conducted are summarized:

a. *Dimensional Stability.* Coefficients of thermal and hygroscopic expansion are determined for coated and uncoated plastics, in both longitudinal and transverse directions of the samples where possible. These coefficients were determined by measuring with mensurator microscopes reading to 0.0001 inch the expansion and contraction of the material under controlled variations in temperature and relative humidity, without removing the samples from the conditioning atmosphere (Figures 2 and 3). Coefficients so determined are summarized in Table I.

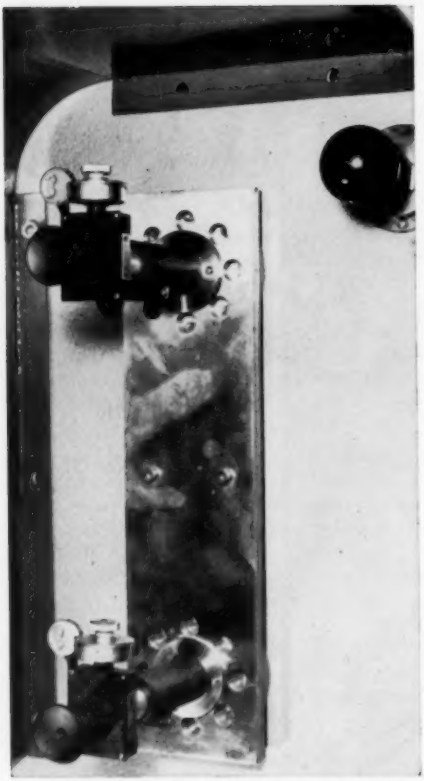
b. *Blue-light Density.* The relative opacity of each coating to light affecting lithographic press-plate emulsions was determined by successive exposures of 6 to 60 minutes in 6-minute increments, in contact with normal bichromated emulsion coated press plates. When correlation between the color-sensitivity of press-plate emulsions and commercial blue-sensitive photochemical film emulsions was established, later tests were conducted with a 400-watt mercury vapor lamp at four feet from the blue-sensitive film, using a 1-minute exposure and interposing a calibrated neutral-density step-wedge between the coated plastic and the film to secure the equivalent of from 0.2 seconds to 58 seconds exposure of the film. These exposures correspond approximately to from 2½ minutes to 3 hours exposure to the slower press-plate emulsion, and furnish a rapid means of comparing the relative opacity of various coatings.

c. *Scribing and Jamming Pressures.* Minimum pressure required to scribe with a 0.004 inch rigid round tungsten carbide

TABLE I.

Dimensional Stability of Coated and Uncoated Plastic Sheets

Material	Coefficient of Thermal Expansion (In./in./°F. × 10^{-5}) Direction		Coefficient of Hygroscopic Expansion (In./in./% r.h. × 10^{-5}) Direction	
	x	y	x	y
Vinyl-chloride acetate, with ERDL service-test scribe-coating	4.90	4.85	0.68	0.60
Uncoated vinyl-chloride acetate, with planished matte surface	4.41	4.18	0.45	0.38
Polyester sheeting, with commercial scribe-coating	1.46	1.26	1.13	1.05
Polyester sheeting, uncoated	1.48	1.17	1.11	1.03
Polyfluorothene sheeting, uncoated	4.84	4.68	0.12	0.00
Cellulose acetate, uncoated	3.98	2.91	7.60	5.52



(Courtesy ERDL, Corps of Engineers, U. S. Army)

FIGURE 3.—Measuring microscopes.

("Carboloy") scribing point and maximum pressures allowable before "jamming" of this point into base plastic occurred are determined for each coating and base combination. From these tests, it was noted that polyester and polyfluorothene bases are inherently less resistant to jamming than the harder vinyl chloride acetates.

d. *Point Wear Rate.* The length of line which can be scribed (at minimum scribing pressure) with a 0.005 inch rigid round steel point hardened to 62C Rockwell, before wearing 0.001 inch off this point (i.e., before lineweight obtained is reduced from 0.005 inch to 0.004 inch) is determined for each coating.

OPERATIONAL EVALUATION

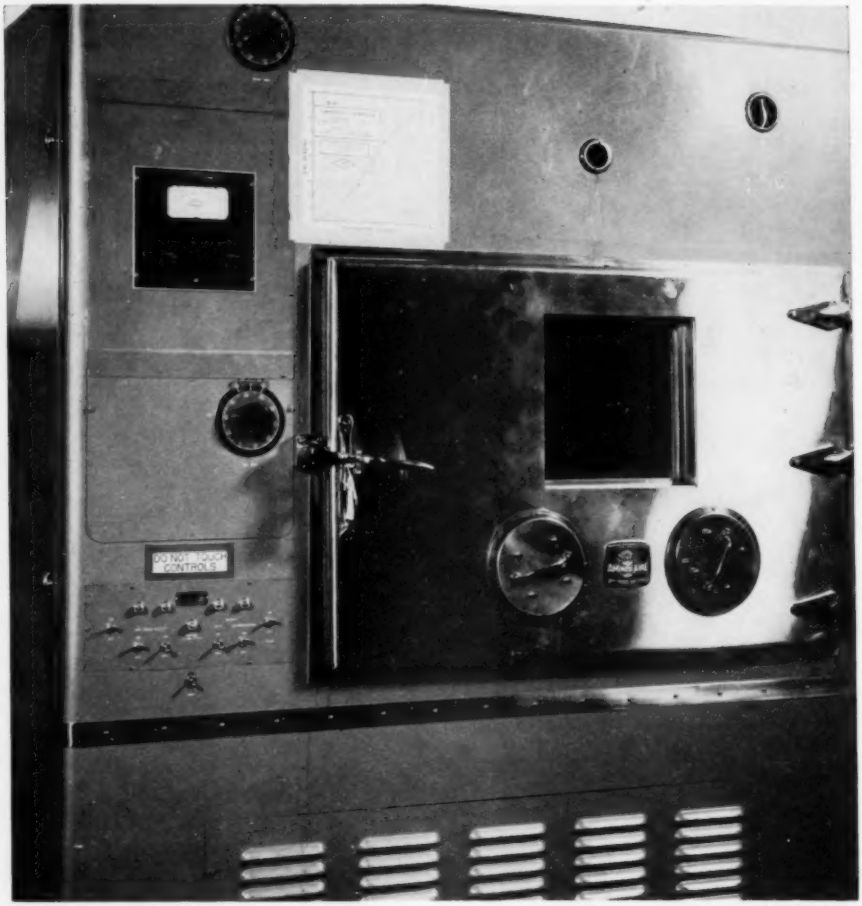
The many intangible factors which contribute to the utility, ease of operation, and training requirements of each plastic-scribing item are evaluated by actual scribing tests performed by both experienced and inexperienced scribing personnel. Improvements and modifications conceived as a result of these tests are discussed in a later paragraph of this article.

ENGINEERING DESIGN STUDIES

All items investigated are evaluated from an overall design standpoint, with particular attention being paid wherever applicable to the use of critical materials, suitability for quantity production at minimum cost, bulk and weight characteristics, ease of assembly and disassembly, probable parts mortality, and maintenance requirements. Wherever indicated by these studies, modifications to development items are included in their design to accomplish the optimum combination of these attributes in each item; and principles or details of items received from other agencies or sources were freely adopted whenever improvement in these attributes could be thereby obtained.

MODIFICATIONS AND NEW DESIGNS

On the basis of objective tests and operational evaluations conducted at ERDL, many areas for improvements in basic instruments, bases and coatings, scribing points, and accessory items were recognized; and research and development effort was directed into those areas where improvement appeared to be most needed. Reports from service test agencies and suggestions from users of plastic-scribing techniques in other Government and private mapping agencies also contributed much to the orientation of ERDL efforts to improve the tools and techniques of the plastic-scribing process. Particularly valuable were the many suggestions and ideas exchanged at the periodic meetings of the Technical Subcommittee on Negative Scribing of the Bureau of the Budget, under the Chairmanship of Walter S. Dix of the Tennessee Valley Authority.



(Courtesy ERDL, Corps of Engineers, U. S. Army)

FIGURE 2.—Temperature-humidity test cabinet.

BASIC INSTRUMENTS

The major shortcoming of the available basic tools for plastic scribing, common to all types obtained and tested, was their dependence on operator hand-pressure to maintain scribing point pressures in the range between minimum scribing pressure for the coating used and maximum pressure allowable before point jamming occurred in the base plastic used. The necessity for keeping this working range practicably large imposed restrictions on the design of scribing points and to a lesser extent on the cutting characteristics required of the scribe-coatings used. The shape of the cutting points, which must usually taper to a point of the desired size, also made some variations in lineweights inevitable when scribing pressure varied within the usable range. A tool design was sought which would eliminate operator hand-pressure entirely as a variable for which allowance must be made. The ERDL scribing tool illustrated in Figure 4 is the basic instrument evolved as a

(Courtesy ERDL, Corps of Engineers, U. S. Army)

FIGURE 4.—ERDL Spring-loaded scribing tool.

result of this study. This tool embodies a simple, adjustable, spring-loading mechanism for controlling the pressure at the scribing point, regardless of the hand-pressure exerted by the operator. Three adjustable, ball-bearing feet support the body of the tool and maintain the vertical orientation of the cutting point, and interchangeable point chucks provide for either rigid or swivel operation. A lead weight is included which loads the tool sufficiently to maintain foot contact and orientation of the point when the operator exerts no downward pressure at all on the instrument, thus reducing scribing of all except the heaviest lines, requiring large cutting pressures, to a simple process of guiding the instrument over the line copy. Lineweight remains constant with any point shape; and jamming the scribing point into the base plastic is impossible with this tool, however great the hand-pressure imposed by the operator. It is thus possible to use scribing points having much higher attack angles, with consequent better visibility and lower cutting pressures, than is the case with conventional tools. A detachable, plastic, magnifying lens, 3 inches in diameter, may be clipped to the main stem of this tool to enable the operator to view the magnified point from a wide angle off the tool axis and for some 300° around the point. Patent applications have been filed covering this tool and the principles involved.

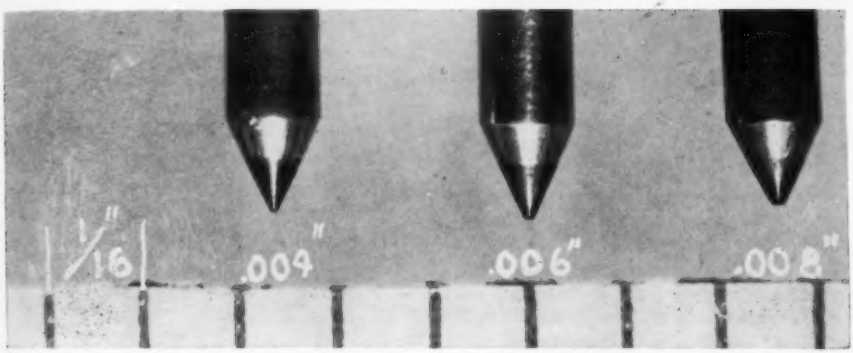
Operational tests demonstrated so many advantages of the spring-loading principle and of the tripod base for maintaining constant point orientation that extension of these advantages to the pen-type, fine-line graver used for light-line contours and with templet for scribing symbols and lettering immediately appeared desirable. Accordingly, a new pen-type scribing tool comprising a tripod base with a spring-loaded point chuck at its center, attached by a flexible joint to a pen-type handle was designed, fabricated, and tested. As a result of these tests, modifications to permit leveling, to provide for a detachable magnifier, and to promote greater stability in operation by attaching the pen handle below the center of gravity of the tripod base were embodied in the "crowfoot" fine-line graver pictured in Figure 5, which is currently undergoing exhaustive tests.

(Courtesy ERDL, Corps of Engineers, U. S. Army)

FIGURE 5.—ERDL Pen-type spring-loaded scribing tool.

SCRIBING POINTS

Development of the ERDL spring-loaded scribing tools makes it possible to scribe without jamming, even with a differential between minimum scribing pressure and point-jamming pressure of as little as four ounces contrasted with the 20- to 40-ounce differential (which does not always prove adequate) for conventional tools. Elimination of the point design limitations imposed by variable hand-pressures made possible the redesign of point shapes to obtain maximum visibility and minimum cutting



(Courtesy ERDL, Corps of Engineers, U. S. Army)

FIGURE 6.—Corundum-tipped scribing points.

pressures and to facilitate machining. Rigid round points were redesigned to provide a single cone 70° tip in place of the 80°/51° double cone formerly used, and all swivel points were redesigned to provide 70° attack angles at the cutting face, with 3° relief angles trailing the cutting edge.

The difficulty of fabricating swivel-type points of the "gooseneck" type furnished with the service test scribing set led to the design of a simple offset chuck attachment to the ERDL spring-loaded tool for holding straight rigid points for swivel operation. Multiple-line points of the straight-shaft type were then designed for use in this chuck.

To meet a requirement for a more efficient means of scribing wide lines (up to 0.036 inch), which require very high pressures with rigid round points, spade points patterned after the multiple-line points but without grooves were designed for cutting all lineweights greater than 0.008 inch.

Examination of printed reproductions of symbols produced with square-, round-, and triangular-tipped scribing points revealed that it is impossible to distinguish with the unaided eye at ten inches viewing distance whether symbols required in small-, medium-, or large-scale maps had been scribed with a round, square, or triangular point. Specially-ground triangular and square points of the type supplied with the service test set of scribing equipment were eliminated from consideration for this practical reason.

Problems of equipment and skill required, as well as time lost from scribing production, in any conceivable system of field-sharpening of scribing points led to the investigation of presharpened, permanent-type points of long-wearing tungsten carbide ("Carboloy") and synthetic corundum (ruby, sapphire). Tungsten carbide and synthetic ruby points were procured for test and evaluation. Wear tests in ERDL service test scribe-coating indicated that neither the "Carboloy" nor the ruby points showed any measurable wear after over 10,000 feet of line-scribing, whereas steel points of comparable size were worn beyond usability after scribing 175 to 200 feet of line in this coating. From these tests, it was concluded that synthetic-ruby permanent-type points are definitely superior for military use, and points of all the types required for military scribing have been procured for final evaluation. (*See* Figure 6.)

COATINGS AND BASE PLASTICS

The objective tests and evaluations described in this article have demonstrated that no single material available at present represents that optimum combination of dimensional stabiltiy, blue-light density, scribing quality, and point-wear rate which would warrant its adoption to the exclusion of all others. (As permanent type scribing points are perfected, the importance of the point-wear rate of coatings will be somewhat lessened from the short-range operational standpoint, but will still be a major

factor in long-range cost considerations.) Each material and sensitizing method contains some points of superiority in at least one characteristic; none represents the best in the field in more than one or two characteristics. Research and development, the primary technical objective of which is the production of an optimum, presensitized, coated, plastic sheeting combining maximum coating-opacity to light affecting press-plate emulsions, maximum scribability, strength, and resistance to environmental deterioration, with minimum abrasiveness, cost, and complexity, is being conducted for these Laboratories by a combination of commercial organizations under a contract recently awarded to American Blueprint Company, Inc., New York, N. Y.

Studies conducted at ERDL in the development of a dyed scribe-coating have resulted in a red-orange dyecoat on polyester sheeting, which coating is opaque to light below 5600 Å wavelength, yet highly transparent to light above about 6100 Å. This coating scribes well, but is insufficiently durable for field use. Further development of this dyecoat is anticipated under the contract mentioned above.

The color of dyed or pigmented scribe-coating is properly dictated by the requirement for opacity to light affecting the photosensitive materials (press-plate emulsions, photomechanical film) with which the scribed sheet is used. A choice between two coating colors having substantially equal opacity may be made on the basis of user eye-comfort, taking into consideration the color and contrast of the compilation image which will be used with the selected coating. However, since it appears likely that the most suitable coatings from the opacity standpoint may well be in the relatively irritating orange-yellow or red-orange zone of the spectrum, a blue filter under the light-table glass or blue fluorescent tubes in the light-table should be considered as one means of reducing or eliminating eye irritation. As improved coatings become available, this expedient will be investigated further.

LETTERING AND SYMBOLIZATION

The application of lettering and symbols which cannot be scribed freehand has been the subject of extensive study by ERDL and its contractors. Current approaches to this problem are of two basic types—the use of special templets for guiding the scribing point in cutting the letters and symbols mechanically, and the use of photochemical means to etch letters and symbols into the scribe-coating. Neither approach has been developed to the point where all letters and all symbols needed in military mapping can be produced in the scribed color separations to produce a single negative master sheet for each color to appear in the finished map. Of the two approaches, the photochemical system appears to offer the most promise. Development of suitable lettering and symbolization techniques is a secondary technical objective under the contract for development of an optimum coating and base-plastic combination and will be accelerated when the formulation of this coating is complete.

SUMMARY

The Engineer Research and Development Laboratories, as the agency within the Department of Defense designated the responsibility for research in materials for cartographic drafting, is actively investigating and developing improved materials and techniques for plastic-scribing color-separation drafting. These investigations have produced instruments and accessory items which for military use are demonstrably superior to those available from sources outside the Department of Defense, and which offer concrete and substantial advantages for all users of plastic-scribing methods. Developments now in progress are planned to increase still further the efficiency and ease of plastic scribing and related operations, with consequent benefits in rapid, economical production of quality maps by all topographic organizations.

Photogrammetry Applied to Cadastral Surveys

By HERBERT F. TRAGER

PHOTOGRAMMETRIC ENGINEER, ZEISS-AEROTOPOGRAPH
MUNICH, WEST GERMANY

THE APPLICATION of aerophotogrammetric methods to cadastral surveys has been tested in considerable detail recently in Germany on the *Bergen Reallotment Project*. The investigations were conducted by Walter A. Brucklacher, Oberkochen, Germany, Chief Engineer of Zeiss-Aerotopograph, Munich. The project was large in scope, including an area of 2,120 acres, and permitted a thorough evaluation of errors which were attributable exclusively to photogrammetry. This paper deals with the work on this project and the exposition and evaluation of errors.

The special conditions on which the cadastral surveys of the project were based have deep cultural roots. Because of the division and subdivision of agricultural areas among heirs, which has gone on for many generations in Europe and particularly in Germany, many estates have been broken up into small and even diminutive lots which can be cultivated only with considerable difficulty. Some farmers have had up to 30 or more different lots distributed over a large area. The great distance between the different lots was a prime factor which adversely affected economic cultivation. To increase productivity and financial returns and to lay out the new roads and paths required for efficient cultivation, so-called reallotments are made which obliterate the old boundary lines and allocate larger and more homogeneous lots to the farmers. A smaller number of estates of larger size permit more efficient use of agricultural machinery and therefore more intensive cultivation, all of which is indispensable for increased returns on the investment.

Presented at the Fifteenth Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., Mar. 9–11, 1955.

The problems of cadastral surveys dealing with a case of this kind are as follows:

1. Surveying of agricultural property before the reallotment if such a precise survey has never been made;
2. Drawing up the reallotment plan;
3. Transfer of the reallotment plan to the field, resulting in the obliteration of the old boundary lines; and
4. Surveying the reorganized property which the farmers have accepted as legally binding.

Final surveys of this type subsequent to a reallotment have been successfully performed in Germany in several instances by photogrammetric methods. The experimental surveying on the Bergen Project was done in close cooperation with the German authorities responsible for carrying out reallotment activities. The final terrestrial survey had already been completed so that these data could be checked against the results obtained by photogrammetric methods. The monumentation and marking of control points had also been made by the reallotment authorities. Photogrammetric plotting was performed by Zeiss-Aerotopograph on the Stereoplanigraph C–8, using aerial photographs taken with a Zeiss Topar camera at flying heights of 4,200 feet, 5,700 feet, and 6,900 feet.

ORGANIZATION OF PHOTOGRAMMETRIC PLOTTING

To permit the evaluation of the application of photogrammetry to cadastral surveys, the following tasks had to be accomplished:

1. Plotting of a map at 1:2,000 showing all signalized points and topographical features;
2. Construction of a contour map with 15-foot contour intervals;
3. Tabulation of the coordinate values of all points for whjch the Gauss-Krueger coordinates had been determined during the terrestrial survey. (Problems 1 through 3 were

solved by using only the photographs taken at an altitude of 5,700 feet.)

4. Complete plotting of the coordinates of the photographs taken at 6,900 feet and plotting of several picture pairs taken at a flying height of 4,200 feet to permit a comparison of the precision obtainable with the different image scales.

5. Comparison of distances determined by terrestrial measurements with the distances obtained from the photogrammetric coordinates. At the same time, an investigation was made into the absolute precision of photogrammetric measuring techniques.

6. A second determination of the accuracy of photogrammetric measurements independent of item 5, by a comparison of photogrammetric measurements made of the same area using pictures taken from different flying heights. Thus, a determination of errors independent of the results of the terrestrial surveys (in which some measuring errors were inherent) was obtained.

7. Determination of the accuracy of graphical plotting by means of a glass scale.

8. Scaling of polygon sides and distances between markers from graphical drawings and comparison with the values measured in the field.

9. Determination of the time required for the different operational phases to evaluate the economy of the process.

AERIAL PHOTOGRAPHY

Marking.—One of the most important conditions of a cadastral survey by aerophotogrammetric methods is the marking of boundary stones, and trigonometric and polygon points, as obviously only those features which are visible from the air can be recorded by the camera.

In Germany, trigonometric points are marked by stones having a square cross section. To make these stones visible from the air, the projections above the ground, that is, the top and the sides, were painted white. Furthermore, a circular disk approximately 12 inches in diameter and made of plaster of Paris, was provided around each marker. The polygon points and the intermediate points were marked by iron pipes sunk in the ground. Each of these was marked with a 12-inch circle of plaster of Paris to facilitate visibility from the air.

Boundary stones were marked with whitewash only on the top, since they are 5 to 6 inches square. Quite frequently these boundary stones were hidden by vegetation, and the underbrush and turf had to be cleared away from them.

Photo-flying.—The entire area to be surveyed was completely covered by aerial photography. The flying strips had a longitudinal overlap of 60% and a side overlap of 30%. The camera used for the mission was an Aerial Survey Camera RMK 21/18, manufactured by Zeiss - Aerotopograph, equipped with a high-performance Topar lens f/4 with a focal length of 8¼ inches. The exposure time was 1/200 second using a yellow filter "D" with a penetration of 525 mμ.

PARTICULARS OF PHOTOGRAMMETRIC PLOTTING

A control point whose x, y, and z values were supplied by the authorities was selected in each of four corners of each stereoscopic model. In addition, one vertical-control point in the center of each model was established for vertification purposes. All these points were selected in such a manner that the control points on one model could also be used for adjacent models. Naturally, the number of control points required varied with the different flying heights.

TABLE 1.—*Ground Control Points for Different Flying Heights*

Flight Height (ft.)	Picture-scale	No. of Pictures	Size of One Model (km²)	No. of Ground-Control Points			
				Total		Per km²	
				(xyz)	(z)	(xyz)	(z)
4,200	1: 6,200	40	0.3	80	39	9	4.5
5,700	1: 8,400	23	0.6	47	22	5	2.0
6,900	1:10,000	13	0.8	26	12	3	0.7

Photogrammetric plotting operations were planned and organized with a maximum of care, due consideration being given to all conditions that might cause errors. Every attempt was made to eliminate these conditions so far as possible. As an example, all diapositives were exposed within about an hour to prevent any shrinkage differentials. The calibrated focal length of all diapositives coincided within ± 0.01 mm. Aluminum-backed drawing paper of 0.3 mm thickness was used for graphical plotting. All map sheets were provided with grids on the tracing table of the Stereoplanigraph. At the same time, the control points were recorded by means of the counting registers.

Stereo-Plotting on the Stereoplanigraph. —Relative orientation of the models was accomplished according to the symmetric semi-computational process developed by von Gruber. The scale was determined by means of reference distances determined both from terrestrial coordinates and the machine coordinates of the control points. The accuracy of adjustment was 1/10,000 of the total length; therefore, a distance of one mile was transferred with an accuracy of about 6 inches. Leveling of the model was accomplished with an accuracy of about 8 inches, which is more than adequate for the tracing of 15-foot contour intervals.

To create unequivocal conditions for the succeeding investigations into the accuracy obtained, the orientation of the pictures taken at three different flying heights was made at twice the picture scale. Projection distances of approximately the same value in the Stereoplanigraph resulted.

The determination of the numerical coordinates of approximately 670 new points was made simultaneously with their graphical plotting. All points were set in the instrument twice by means of the measuring mark, in two independent operations; the coordinates were recorded on the printing counter and the point numbers transferred to the graphical drawing. Setting of the control points, which could be identified in the pictures as small white specks clearly distinguished from the surrounding terrain, was not made with the conventional floating mark, but rather with the adjusting cross mark located in the universal joint of the mirrors. Normally this cross mark whose legs hardly exceed 12 microns, and which has approximately the same size as the diameter of the signalized points, is not noticeable because of its smallness. In conjunction with an annular luminous mark, which greatly facilitates the location of the minute cross mark, the adjusting cross mark lends itself admirably to this type of work. Measurements yield a very high precision because the eye unconsciously divides the small white speck into four segments of equal size. The small luminous-dot mark was utilized for the tracing of contour lines.

The remaining 2,310 signalized points were set and marked on the Stereoplanigraph. The connecting lines between the points followed the boundary lines. This operation was followed by the tracing of topographical features.

On the basis of the four or five given control points the transformation formulas for the Helmert transformation were established. After this operation was completed, the machine coordinates of all 670 points were converted.

The mean values of the scale factors of the transformation formulas provided a yardstick for the accuracy of the scale settings in the instrument. These factors were approximately $\pm 1.7 \times 10^{-4}$, and the angles approximately $\pm 1^{c}\ 27^{cc}$.

The transformed coordinates were tabulated and submitted to the Reallotment Authorities, together with the graphical drawings, as the final step.

Only after the results of the photogrammetric measurements had been turned in were the Authorities asked for the terrestrial coordinates of all signalized reference points, as well as distances between the markers and the polygon sides measured directly. This permitted an investigation of the precision that had been obtained.

To obtain reference data for future planning of similar projects, the time required for the individual phases of each operation was recorded in man-hours while the work was in progress.

Setting Accuracy.—Since every point was set twice on the same model with the simultaneous printing of the coordinates, the double adjustments permitted derivation of the mean error of the individual setting. The formula for the determination of the mean setting error for one setting and the formula for the determination of the mean error of the arithmetic average were used to compute the results shown in Table 2.

If, now, the Δx and Δy values are computed for individual points distributed uniformly over the entire model surface and we form the mean values for Δx and Δy, the following ratio exists:

$$\Delta x : \Delta y = 1 : 1.65$$

This ratio corresponds exactly to that determined by photogrammetric measurements.

It should be noted that this relationship applies only to vertical photographs. For convergent views the vertical setting accuracy is much higher. This advantage is due to the more favorable base ratio; hence the horizontal-position accuracy is also improved indirectly. The setting accuracy is the same in X and Y for convergent views. This feature adds more weight to the opinion which has been frequently expressed by experts; namely, that the utilization of convergent views for high-precision measurements offers a great number of advantages.

TABLE 2.—*Mean Setting Errors*

Flight Height (ft.)	Mean Square Root Error of a Single Measurement			Mean Square Root Error of the Arithmetic Mean		
	m_x mm (inches on the ground)	m_y mm (inches on the ground)	m_s mm (inches on the ground)	M_x mm (inches on the ground)	M_y mm (inches on the ground)	M_s mm (inches on the ground)
4,200	±0.007 (±0.83)	±0.010 (±1.12)	±0.012 (±1.46)	±0.005 (±0.59)	±0.0075 (±0.91)	±0.009 (±1.06)
5,700	±0.006 (±0.94)	±0.011 (±1.73)	±0.0125 (±1.98)	±0.0043 (±0.67)	±0.0077 (±1.22)	±0.009 (±1.38)
6,900	±0.006 (±1.12)	±0.011 (±2.16)	±0.0125 (±2.48)	±0.0045 (±0.87)	±0.008 (±1.58)	±0.009 (±1.82)

The values in Table 2 include a possible error caused by the printing counter. It should be noted that approximately the same projection distances were chosen for the pictures taken on flights at different altitudes. As a result, mean setting errors of the same magnitude were obtained in the different models. When converted into centimeters the errors are inversely proportional to the model scales. Nevertheless, a phenomenon occurred which deserves special mention.

The mean setting errors for y at all flying heights are 1.7 times larger than the corresponding errors for x. Thorough analyses were made, including an investigation of the plotting instrument and the printing counter, which revealed that this difference in the setting accuracy was caused by the vertical setting error. If it is assumed that a vertical setting error exists and it is constant over the entire model, relationships can be determined for the horizontal-position error where Δh is the vertical setting error.

COMPARISON BETWEEN COORDINATES DETERMINED BY TERRESTRIAL AND PHOTOGRAMMETRIC METHODS

For a comparison of the coordinates determined by both terrestrial and photogrammetric methods, 666 points were used for plotting the photographs taken at a height of 5,700 ft.; 617 points for the photographs taken at 6,900 ft.; and 117 points for the pictures taken at 4,200 ft. Only four models were plotted from pictures taken at the 4,200-foot height. In the following

discussion of the errors, those points which also served as control points were disregarded. Finally, mean differentials given in Table 3 were computed according to the formula

$$md = \sqrt{\frac{[d\ d]}{n}}$$

complished individually. These control points contain a certain error element.

COMPARISON OF LENGTHS WITH DISTANCES MEASURED DIRECTLY IN THE FIELD

Distances were computed from the coordinates determined photogrammetrically and compared with those measured in the field. Since the latter contain an element of error which is affected by their length, the distances were tabulated in groups.

In Table 5 the first column shows the lengths in meters, whereas the second, fourth, and sixth columns show the number of distances included in the comparison at the different flying heights. The mean dif-

TABLE 3.—*Differentials Between Terrestrial and Photogrammetric Coordinates*

Flight Height (ft.)	Number of Points	Mean Differences			Maximum Differences		Number and (Sum) of	
		dx (inches)	*dy* (inches)	*ds* (inches)	*dx* max. (inches)	*dy* max. (inches)	$+dx$ $-dx$ (m)	$+dy$ $-dy$ (m)
4,200	117	±3.04	±3.62	±4.72	− 8.66	+ 9.10	51(+250)	55(+374)
						− 9.10	66(−456)	62(−467)
5,700	666	±4.33	±3.85	±5.84	−17.00	+14.20	311(+2659)	395(+3577)
							355(−3021)	271(−1550)
6,900	617	±4.88	±4.00	±6.33	+17.4	−14.20	347(+3351)	311(+2393)
							270(−2441)	306(−2660)

In evaluating Table 3, note that the absolute photogrammetric error is not shown, but the differentials between the coordinates are found by two entirely different methods.

A certain number of points were determined twice in the marginal zones of the models. A comparison between the points determined twice by the reiterative process is given in Table 4.

TABLE 4.—*Differentials Between Coordinates in Marginal Zones*

Flight Height (ft.)	Number of Points	Mean Differences (inches)			Maximum Differences (inches)		MSRE of Single Photograph Determination of a Point Double Overlapped (inches)		
		dx	*dy*	*ds*	*dx* max	*dy* max	*mx*	*my*	*ms*
4,200	28	±2.76	±2.64	±3.82	5.12	7.09	±1.93	±1.85	±2.68
5,700	122	±3.86	±3.94	±5.52	9.05	10.6	±2.72	±2.80	±3.90
6,900	86	±4.96	±4.10	±6.38	11.10	9.05	±3.50	±2.80	±4.45

The differentials listed in Table 4 do not show the absolute photogrammetric error. As already mentioned, relative and absolute orientation of the models on control points determined by terrestrial methods were accurate. The differentials fall between 2.4″ and 5″. It must be remembered that the longer distances surveyed on the ground, will contain a larger element of error. Furthermore, it was possible to include in the comparison

TABLE 5.—*Differences Between Photogrammetric Measurements and Field Distances*

Group of Length (m)	Number of Points	h = 4,200 ft. Mean Difference (inches)	Number of Points	h = 5,700 ft. Mean Difference (inches)	Number of Points	h = 6,900 ft. Mean Difference (inches)
0–6	41	±2.63	41	±2.88	32	±3.15
6–10	29	±2.35	24	±3.31	19	±2.72
10–20	11	±2.76	27	±3.51	25	±3.11
20–40	8	±2.56	26	±3.55	23	±4.23
40–60	14	±3.94	53	±4.10	40	±4.02
60–80	18	±3.28	70	±3.94	62	±3.67
80–100	15	±3.75	66	±3.90	57	±3.42
100–150	29	±3.59	114	±5.00	101	±4.74
150 and longer	18	±3.86	71	±4.70	58	±4.62
Means and (Sums)	(183)	±3.19	(492)	±3.87	(417)	±3.74

distances whose ends were located in two different models. The differentials determined in these cases ranged from 3.7″ at 4,200 feet to 6.4″ at 6,900 feet.

To evaluate the absolute errors that can be attributed to photogrammetry, it was assumed that short distances up to 30 feet, which had been determined on the ground, were free from errors. This assumption can safely be made since the 30-foot length is shorter than a measuring tape.

The differentials determined in this manner may therefore be used for ascertaining the mean error of photogrammetric measurements. Table 6 shows the mean distance errors for the different flying heights.

A COMPARISON OF MODELS COVERING THE SAME TERRAIN TAKEN FROM THREE DIFFERENT FLYING HEIGHTS

In various parts of the surveyed area, the models from three different flying heights overlapped with the exception of the surfaces. The overlapping models were transformed to the same control points, and the coordinates of the other signalized points which had been determined photogrammetrically three times were checked against each other without the aid of terrestrial coordinates. Since the values of coordinates determined from three different flying heights are not the same, factors corresponding to the reciprocal values of the fly-

TABLE 6.—*Mean Errors in Photogrammetric Measurements at Different Flying Heights*

Flight Height (ft.)	Number of Lengths from 0 to 10 meters	Error of Photogrammetric Measurement	
		m_s (inches)	$m_x = m_y$ (inches)
4,200	70	±2.51	±1.78
5,700	65	±3.02	±2.12
6,900	51	±2.96	±2.09

ing heights were introduced to ascertain the most probable value. The factors are

$$p/4200 = 0.33$$
$$p/5700 = 0.25$$
$$p/6900 = 0.20$$

Table 7 shows the mean error of the photogrammetric coordinates when plotted in this manner. Note that the results obtained check within 10% the results of the short distances which were assumed to be free from errors.

1. The setting error
2. The errors inherent in the taking and plotting equipment
3. The error produced by irregular film shrinkage

It was mentioned at the beginning of this paper that the setting error is known. If it is assumed that the two last named errors have the same magnitude, the error produced by irregular film shrinkage may be easily derived:

TABLE 7.—*Mean Errors in Photogrammetric Coordinates After Application of Reciprocal Adjustments*

Flight Height (ft.)	Mean Square Root Error of Photogrammetric Measurement		
	m_x (inches)	m_y (inches)	m_s (inches)
4,200	±2.05	±1.58	±2.56
5,700	±1.75	±2.10	±2.76
6,900	±2.76	±2.51	±3.74

In conclusion, attention is directed to the fact that the two errors of an absolute photogrammetric measurement determined independently are the most important result of these investigations. Table 8 shows the consolidation of these two errors.

$$\text{Film shrinkage error} = \sqrt{\frac{9.2^2 - 3.6^2}{2}} = \pm 6\mu$$

This conclusion checks very well with the results of extensive investigations on film shrinkage covering a period of several years.

TABLE 8.—*Consolidation of Independent Errors in Photogrammetric Measurement*

Flight Height (ft.)	Scale of Photos	Mean Square Root Error of a Single Gained Point and of a Length by Photogrammetric Measurement	
		(inches)	(microns)
4,200	1:6,200	±2.56	±10.5
5,700	1:8,400	±2.88	± 8.7
6,900	1:10,000	±3.31	± 8.4
			± 9.2

The mean point and distance error is between ± 2.6″ to ± 3.3″. The mean error as referred to the picture plane is ± 9.2 μ. This error includes all other errors from the taking of the photographs to the finished coordinate tabulation sheet as follows:

According to these investigations the mean irregular film shrinkage error is about ± 5 microns. There is, therefore, no reason to replace film by plates for precise measurements of this nature. The verification of graphical drawing was accomplished by a

check with the glass scale, and revealed a graphical plotting accuracy of ± 0.1 mm for the X and Y coordinates.

These test measurements, of which only a brief extract has been given, will soon be published in more detailed form by Mr. Brucklacher. It should be noted that a wide test of the application of aerophotogrammetric methods to cadastral surveys was made on this project. A thorough evaluation of errors attributable exclusively to photogrammetry was made and recorded in detail, including the consolidation of independent errors. The *Bergen Reallotment Project* provided an excellent ground for these applications and tests.

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Rand McNally & Company Centennial

Rand McNally & Company which is celebrating its Centennial throughout 1956, was founded 100 years ago when William H. Rand, a printer from Boston, set up a printing office over a book store at what was then 148 Lake St., Chicago. In 1858, Andrew McNally, then 22, came to work an Rand's shop, and the following year the printing business was consolidated with the *Press and Tribune*, which became *The Chicago Tribune* on November 1, 1860. Rand operated the newspaper's printing department, and when *The Chicago Tribune* was incorporated on February 18, 1861, he was head of the mechanical division and owned a one-eighth interest in the paper.

McNally became foreman of the job printing department in 1862 while it was under Rand's management. Six years later, in May 1868, the two men purchased the Tribune's interest and formed Rand McNally & Company.

The company had established a reputation as a specialist in railroad printing and began publishing the *Rand McNally Railway Guide* in 1871. The railroads' need for maps in their timetables and literature led to the establishment of a mapmaking department, and the first Rand McNally maps appeared in 1872.

It was not until 1875, however, that the company began commercial publishing with a *New Map and Guide to the Black Hills*. The first wall-size *Railroad and County Map of the United States* came in 1876 as did the first *Business Atlas* (later the *Commercial Atlas*) and the first *Pocket Maps* of the States and Territories.

The first edition of *Bankers Directory* came off the press in 1872. It's purpose: "To furnish the financial and commercial world with a reliable list of the banks and bankers of the country."

Bankers Monthly first made its appearance on January 28, 1884, at a time when "The rapid developing of the resources of the country, especially in the Western States and Territories, has called for a corresponding extention of banking facilities."

In 1915 the company published its first road maps, and three years later cooperated with the State of Wisconsin in developing a system of numbered highways from which grew the present national system. The company published the first complete set of road maps of the United States in 1922.

In 1927 it produced the first atlas of the world recognizing and showing the local form of spelling in all foreign countries.

During the following year Rand McNally produced the first set of U. S. State maps showing aeronautical aids and factors necessary for the safe navigation of aircraft.

Best known as the world's largest producers of maps, the company is, however, engaged in various other types of printing and publishing which actually account for the larger percentage of its business. Its activities also include printing more than five million railroad timetables and a majority of the railroad, airline, and bus tickets in use in the United States and many foreign countries. It also produces school textbooks, adult non-fiction, and millions of juveniles each year.

The company has been a strong supporter of the American Congress on Surveying and Mapping since 1944 and a number of their representatives have actively participated in the society's activities. We take this opportunity to congratulate them on the occasion of their Centennial and hope that the next hundred years will bring them luck and prosperity.

Documentation of Surveying in the Epics of Homer

By ZVONIMIR KRALJ

TRANSLATED AND EDITED BY MARY A. EMERY

EDITOR'S NOTE.—This paper has come to the pages of SURVEYING AND MAPPING the hard way. The original paper by Dr. Zvonimir Kralj was published in No. 9–12, 1954, of *Geodetski List*, Zagreb, Yugoslavia. It was translated and edited by Dr. Mary A. Emery, Freeport, N. Y. In preparing this manuscript for publication, the editor, who admits that he has never read either The Iliad or The Odyssey in *any* language, has avoided, as far as possible, the making of editorial changes. Except for the correction of a few obvious typing errors in the manuscript and some minor changes in the form in which the material was presented, the following is practically a "Chinese copy" of the manuscript. This may serve to explain certain apparent rough spots in this triple play—Greek to Yugoslavian to English.

HOMER'S EPICS, The Iliad and The Odyssey, serve as rich sources for the study of political, social, and economical conditions in Old Greece. The epics offer valuable information about the agrarian relations of that time, closely related to the surveying activities. The purpose of this article is limited: the author desires to call attention of the readers to selected quotations from the two epics telling directly or indirectly about surveying in Old Greece. He claims that documentation of surveying in the epics of Homer was not yet noticed in the world literature. The author presumes that a serious research work may discover much additional information.

There is mentioned in The Iliad and in The Odyssey the following information referring to surveying:

1. Marking of boundaries
2. Square measures
3. Regulation of disputed boundaries
4. Division of land
5. Surveying
6. Ground donation
7. Miscellany

The era of this documenation is designated by a broad term of the preclassical era of the Old Hellas. It could be the period of the Trojan War (XII century B. C.); the time when Homer lived (IX century B. C.), in case he actually lived, and his epics appeared; or the time when the epics were put into written form (VI and perhaps VII centuries B. C).

All lines of interest are not quoted in this article. The author omits lines referring to the same kind of documentation and does not wish to overload a professional magazine with poetry. The quotations are marked in the usual way (Book and Line) and are easy to find in the epics.

Marking of Boundaries

The author begins his documentation with a testimony referring to the existence of landmarks. A large stone placed on the field served as boundary sign. Describing a conflict between Goddess Pallas and God Mars, Homer says in The Iliad, Book XXI, 499–503:

> . . . She only stepped
> Backward a space, and with her powerful hand
> Lifted a stone that lay upon the plain,
> Black, huge, and jagged, which the men of old
> Had placed there for a landmark. . . .

This scene is of particular interest, as it also appears in Aeneid, by Virgil, and in Italian and French literature. Virgil, Aeneid, Book XII, p. 285:

> And without further parle, he looked round on a mighty rock, a mighty rock and ancient, which haply lay on plain, set there as a landmark to ward dispute from the fields.

Square Measures

Homer knows a definite square measure and makes a note of it in several places. In The Iliad, Book IX, 718–721, the chiefs of the Aetolians asked Meleager to come to their defence, and they promised him large gifts:

. . . Where the soil of Calydon
Was best, they bade him choose a fruitful field
Of fifty acres, half vines, and half
Cleared of the trees, for tillage.

In The Odyssey are other examples. Book VII, 112–113:

But without by the gate of the forecourt a garden gate there lies,
Four plough-gates wide, and about it all a hedge doth go.

In Book XI, 576–577:

And Tityus there I looked on, the glorious Earth's own son
On the earth a-laying along; and o'er nine roods he spread.

And further, in Book XVIII, 374–375:

And there were the close four-acred, and the clod of the
Plough-share to yield, . . .

To date the actual size of Homer's "acre" is not known. Translators usually identify it with some old square measure of their own country. In two places the Greek original uses the word "Plethron," the size of which was established as being 950 square meters. However, exactly in these places one finds such poetical exaggerations that comparison with the present square measures is out of the question. One reads, for instance, in the above described conflict, The Iliad, Book XXI, 504–506:

. . . This (the stone) she hurled
At Mars, and struck him on the neck; he fell
With nerveless limbs, and covered as he lay,
Seven acres of the field.

Regulation of Disputed Boundaries

Regulation of a disputed common boundary is vividly described in a comparison. The Iliad, Book XII, 503–508:

. . . As two men upon a field
With measuring-rods in the hands, disputing stand
Over the common boundary, in small space,
Each one contending for the right he claims,
So, kept asunder by the breastwork, fought
The warriors over it, . . .

The great poet could invent and imagine deities, but a scene like this in all probability has been taken from real life.

Division of Land

Division of real estate among the legitimate relatives is quoted in The Odyssey, Book XIV, 208–210:

. . . and his sons straight fell to share
His livelihood amongst them, and the lots thereover threw.
But to me they gave but a little, and gave me a house thereto, . . .

Surveying

Among interesting and important words with different translations from the Greek original are "temenos" and "kleros." The linguists give a descriptive translation to the word "temenos," which is mentioned in 13 places in Homer's epics. "Temenos" is mostly translated as a cut off, staked out, or set apart piece of land given to somebody in ownership. From this description, which is in harmony with the content of all quotations from the epics, arises the necessity of surveying that piece of land. The following examples are from The Iliad. Book VI, 249–253:

. . . Giving him to wife
His daughter, and dividing with him all
His kingly honors, while the Lycians set
Their richest fields apart, a goodly spot
Ploughlands and vineyards for the prince to till.

Book XII, 376–378, mentions the word *enclosure* for "temenos";

. . . And why do we possess
Broad, beautiful enclosures, full of vines
And wheat, besides the Xanthus? . . .

Book XVIII, 675–681, speaks of a field and the border of this field:

. . . A broad, fallow field
Of soft rich mould, trice ploughed, and over which
Walked many a ploughman, guiding to and fro

His steers, and when on their return they reached
The border of the field, the master came
To meet them, placing in the hands of each
A goblet of rich wine. . . .

Book XX, 234–237, contains the word *acres* conferred as a gift:

Or will the Trojans, if thou slayest me,
Bestow on thee broad acres, of a soil
. . . Fruitful exceedingly, and suited well
To vines or to the plough, which thou mayest till.

The Odyssey mentions the word "garth" in Book VI, 291–293:

A glorious grove of Athene shalt thou find, the way beside
Of poplars, wherein is a well, and about it a meadow wide
And there is the garth of my father and his garden growing fair.

As can be noticed, the word "temenos" has different translations; field, enclosure, acre, garth, etc. In the translations written in prose, the word "temenos" is rendered as "king's land," or in the Russian literature even as "czar's land." However, Greece of that period had no sovereign. In the era of Homer, there were numerous more-or-less independent rulers called in the original "basileus." These rulers or kings belonged to the ruling class of the best, "aristoi," and obtained by force, or for special merits, the "temenos"—a parcel of land from the common or all-peoples land. The surveyors used to survey these parcels of land.

In the Iliad, the word "temenos" has another meaning. Here it means a land consecrated to a deity, a land belonging to a shrine or a temple. Since this parcel of land had definite boundaries, surveying should have been applied. One reads in The Iliad, Book VII, 53–57, about the sacred field of Jove the Thunderer.

. . . Flew they (the Jove's steeds) between the earth and the heaven
Until he came to Ida, moist with springs
Where lay his sacred field,
And where his fragrant altar fumed.

Achilles, mourning the death of his friend Patroclus, says in Book XXII, 173–177:

. . . Sperochius, in vain my father made a vow
That I returning to my native shore
Should bring my hair, an offering to thee,
And slay a consecrated hecatomb,
And burn a sacrifice of fifty rams,
Beside the spring where in a sacred field
Thy fragrant altar stands . . .

Ground Donation

Agrarian history attributes great importance to and gives several meanings for the word "kleros." This word appears in the epics with two different meanings: as a dice or decision by casting dice, and as a deed or title to the ownership of a land.

In The Odyssey, the swineherd Eumaeus praises his master who presented him with land "kleros," Book XIV, 60–66:

. . . Ah, verily that man's homefare the Gods perforce have stayed
Who would have cherished me dearly, and given me gear to aid,
An acre and a homestead. . . .

This is a one-sided legal act, and surveying would have here no special importance. And in The Iliad one reads in Book XV, 629–633:

. . . 't is no inglorious fate
To perhish fighting in his country's cause;
And he shall leave his wife and children safe,
His home and household store inviolate,
If now the Greeks depart to their own land.

The title of land ownership is not obvious, the land is called "kleros," and some translators conclude that it is a kind of soldiers' land.

Miscellany

All documenations presented to this point deal with surveying concerning ownership and types of land. Documentations about surveying applied in other aspects of social life are less frequent and voluminous. The few passages deal with the following activities:

1. Measuring off a fitting space for a combat. (The Iliad, Book III, 391–395)

2. Drawing a circle for a sepulchre, and laying its foundation. (The Iliad, Book XXXIII, 314–317)

3. Measuring distance between twelve iron axes, and setting them up in a straight line. (The Odyssey, Book XXI, 120–123)

4. Applying an instrument for measurement of length, a rule. (The Odyssey, Book XXI, 43–44 and Book, XXIII, 196–198)

Herewith is terminated the documentation by Homer with reference to surveying activities.

It can be seen from the former presentation that the epics of Homer bear evidence about surveying much more than it could be expected from poetry. Of course, the poet handles surveying as a secondary matter, as an assistance in achieving his poetic expression and effects. Nevertheless, all information and data are faithfully taken from the life of that time and contain no tendencies or attempts to heighten the interest of a scene by imaginative additions.

This article is not a historic research work. It merely registers historic information and points out where to look for the materials for a further, interesting, and necessary research.

This future research work dealing with the combined data of surveying found in the epics of Homer will result in understanding of the past, since the past experiences are preserved in the present practice. In other words, the further study of Homer's epics will lead the reader to the conception that the past of mankind is preserved in the present, which opens new horizons into the future. This is the final and highest aim of history.

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Aero Service Photographs Cuba

Photo-mapping of the entire island of Cuba and adjacent islands of the Republic of Cuba was begun January 23, 1956, by Aero Service Corporation, Philadelphia, Pa. The air photos will be used for geologic studies and general reconnaissance by the oil and mining industries, as well as by engineering companies and others at work on Cuban development.

Two specially outfitted P-38s are photographing Cuba's 44,000 square miles from a height of 35,000 feet. Each 9- by 9-inch photograph covers an area of about 80 square miles. Approximately 3,000 photographs will be made. The photo scale is 1:60,000. The overlap will be about 56% along the line of flight.

A P-38 can cover about 4,000 square miles per day, flying and mapping at a speed of over 300 miles per hour. At a height of 35,000 feet the pilot and photographer are wholly dependent on the aircraft's oxygen system. At that altitude the temperature is 60 below zero, compared to Cuban ground temperatures of about 85 degrees.

Two bases, Camaguey and Santiago, are being used for the air-survey operation. Mapping can be done only on cloudless days. In January and February, Cuban weather averages about 10 such days per month. If the weather runs true to form, the photography will be completed in February.

Felix Wormser Wins Egleston Medal

Felix E. Wormser, Assistant Secretary of the Interior, who gave the "key address" at the ASP-ACSM Consecutive Meetings in March 1955, has been awarded the Egleston Medal. This is Columbia University's highest award for "distinguished engineering achievement." Thomas Egleston, in whose honor the medal is given, founded the first school of mines in this country at Columbia in 1864.

Mr. Wormser is a graduate of the School of Engineering at Columbia and one of the six alumni trustees of the University.

An Approach to Design of Terrain Representation

By JOHN E. DORNBACH

CARTOGRAPHER, AERONAUTICAL CHART AND INFORMATION CENTER, U.S.A.F.

An increasing amount of attention has been focused on terrain representation on maps and charts in recent years. Some geographers and cartographers have revived some European cartographic methods of the late 19th and early 20th centuries.[1] Others attempt to categorize terrain representation techniques[2] or terrain types[3] according to scale and content. Some criticize the topographic content, implying that more geographic information is needed.[4] Still others suggest the use of artistic terrain patterns which attempt to portray the qualitative appearance of the terrain as observed from the air.[5] All the recommendations or criticisms have some merit, but none appears to satisfy the demands of the map user. The significance of so many approaches appears to be that, as yet, there are few basic principles to follow in designing topographic detail.

It may be asked, "Why is it necessary to represent terrain?" and, "Will there not be as many modes of representation as there are specific types of uses or users?" Regardless of the type or function of a map, it is generally necessary to position point- and line-symbols according to a rigid geodetic framework.[6] Thus, open areas are created on the map between and along linear and point symbols. In such open areas, and in unobscured space beneath symbols, the type of relief representation specific to the purpose of the map can be applied. Instead of considering terrain presentation as a background upon which all other information is superimposed, it is better to regard it as on a par with other representations. For example, on a wall map intended for general educational purposes, some information concerning the "lay-of-the-land" must be presented if the viewer is to comprehend the total geographic complex. On a road map, however, where topographic symbols are of lesser importance, it is less necessary to represent terrain.

It may be postulated then, that the value of chart information as it is portrayed will be in direct relation to the needs of the user in his specific circumstance; the clarity and legibility of the entire display in direct re-

[1] *See* Williams, Joseph E., "The Relief Map." *The Professional Geographer*, Vol. V, No. 5, Sept. 1953, pp. 7–10.

[2] *See* Raisz, Erwin, "Landform, Landscape, Land-Use, and Land-Type Maps." SURVEYING AND MAPPING, Vol. 6, 1946, pp. 220–223.

[3] *See* Hammond, Edwin H., "Small-Scale Continental Landform Maps," *Annals of the Association of American Geographers*, Vol. XLIV, No. 1, March 1954, pp. 33–42.

[4] *See* Ullman, Edward L., "Are Mountains Enough?", *The Professional Geographer*, Vol. V, No. 4, July 1953, pp. 5–8.

[5] *See* Kingsley, Major Robert H. and Holmes, Howard C., "Terrain Representation from Aerial Photographs for Aeronautical Charts," *Photogrammetric Engineering*, Vol. XI, No. 4, Dec. 1945, pp. 267–271.

[6] Occasionally this may be deviated from, e.g., in the case of very special purpose or schematic maps. This is illustrated in Griffin, Donald R., "Topographical Orientation," *Foundations of Psychology*, Edited by Boring, Langfeld, and Weld, John Wiley and Sons, New York, 1948, p. 381. ". . . . 'Maps' inserted in railroad timetables usually make the railroad route appear straight with geography forced to conform to it. The motivation may be partly a desire to make the route of the particular railroad appear short and direct, but the gross distortion of geographical fact also serves a real purpose for the traveler, for the railroad map conforms more closely to the topographical schema of the average traveler than the geographer's accurate maps. The traveler can turn this sort of schematic map into a mental schema more readily because it is already in the right form. . . . . The railroad map and the mental map do not confuse him with geographical information which is of no immediate concern to him."

lation to the situation of viewing, the methods of portrayal, and the systems of reproduction. In designing techniques and symbols for terrain representation, however, the problems of value and "readability" have seldom been considered from the user's standpoint, i.e., as display problems in psychology. More often they are presented as artistic adaptions of conventional cartographic techniques, which bear the appellation of "new approaches" or "new techniques."

Quantitative terrain relief data may be of two types, absolute horizontal measurements (x and y) and vertical (z) components, (e.g. contour lines) or relative measurements in which coordinates of space are derived through computations and do not reproduce actual topography. Methods of representing terrain lie somewhere between pure abstraction of the earth's surface and features (e.g., contour lines and hypsometric tints), and an attempt toward true realism (e.g., "natural color shaded relief"). The end product usually has traces of each in varying combinations. The difficulty comes from attempting to synthesize a universal design from the innumerable available techniques, in an effort to portray vertical-relief without visually disturbing the dimensionality of the x and y coordinates. It is relatively simple to accommodate x and y space coordinates (length and breadth) on a two-dimensional plane. How man may be made to "see" a quantitative third dimension on maps is a problem often attacked but seldom satisfactorily conquered.

Karl Peucker, the Austrian cartographer, conceived this hypothetical equation to illustrate an ideal terrain representation:

$$g = f(x, y, z)$$

where g = terrain (Gelände) and $f(x, y, z)$ = the function of the horizontal and vertical components. He equates x, y, and z as equivalent space coordinates on the map.[7] The horizontal components are areal in nature and are omnipresent, of course, in any two-dimensional representation. To conceive of the z coordinate in terms of a precise scalar measurement, however, one must agree with Peucker that through the use of his "Spectral-Adaptive Plastic Colors," it was possible to measure all elevations accurately with the eye. Peucker believed that in this manner all three dimensions could be made measurable. Max Eckert suggested in qualification that a plastic color-relief presentation, with contour lines and shadow effects, might not provide a measurable quantity (other than that given by the contour), but produce a quality which would be perceptually significant only in making estimations of depth-shapes. This may be clarified by noting that, on a hachure map, the vertical component of terrain (relief) is considered to be perceptually estimable, but not measurable; on a contour map it is not always perceptually estimable, but always measurable. Eckert considered Peucker as far ahead of the field in attempting to formulate laws by which terrain forms could be represented. It was his belief that formalized laws would rule out subjective judgment (". . . und nicht der schwankenden Willkür des individuellen Geschmacks anheimstellt.").[8]

Thus, the value of Peucker's work was not only in the cartographic displays which he produced, but in his approach toward scientific investigation of how man may see and visually measure depth-shapes on a plane surface. Whether or not his rules are scientifically valid is yet to be proven. His published maps, however, refute many of the criticisms leveled against his approach and the principles of cartographic design which he developed.

Within the past several years there has been a renewed tendency to discard many conventions such as hachures, hypsometric tints, and contour lines, and utilize such techniques as "natural color relief," merged-color illuminations, etc., for cartographic displays. Many professional geographers and cartographers have been quick to agree that this is exactly what they have always

[7] *See* Eckert, Max, *Die Kartenwissenschaft*, Walter De Gruyter and Co., Berlin and Leipzig, Vol. I, 1921, p. 501.

[8] *Ibid.*, p. 636.

desired in a map. In consequence, there has been an attempt to apply this type of representation to everything from simple maps in elementary textbooks to the most modern and complex aeronautical charts. Some universities are teaching students of cartography to hand-color haps in this manner. One author suggested that "hypsometric tints" as such are gradually dying out.[9]

If Peucker were alive today he would be appalled at the naivete with which his techniques are being applied. This is not intended as criticism of individuals or publishers who are producing maps for specific purposes, such as instructional wall maps, etc. What is intended is to point to the pedagogical weakness in attempting to adapt a successful technique without regard to the function of the map, the difficulties of production, or the limitations and expense of various reproduction processes. Since much has been written about the production and reproduction of maps, no pertinent arguments will be presented other than to note that few mapmakers, whether private or governmental, can afford the cost of process-color work or a multitude of separate color plates. Mapmakers who use process-color successfully in the United States must compete with the Haack-style wall map Series which can be easily viewed and read in most classrooms, and with commercial products such as 2- or 3-color road maps, with a process-color relief presentation which might please the aesthetic and informational desires of the motorist but do little toward aiding him in orientation.

The aspect of "function" should be paramount in designing cartographic terrain presentations.[10] All too often techniques are devised for ease of production or reproduction without regard to the user. Or it is assumed that a technique satisfactory for one type of user will be satisfactory to all, regardless of function or cost. Of course, it is not possible to produce as many different types of maps as there are users. The important factors to consider, however, are that all users are men, that all normal individuals respond similarly to the stimulations of the visual world, and that man must rely upon some type of visualization for orientation. Psychologists have recognized for some time that geographical orientation is a complex process, possibly calling into play abilities in space perception, visualization, memory, abilities to make abstractions or form concepts, training, environmental background, and even personality and temperament. Regardless of the factorial composition of spatial orientation skills, they know that maps and similar materials are aids to orientation.

The problem of how maps and charts specifically aid man in geographical orientation is as yet unanswered. However, a few significant facts have been formulated in psychological texts which are directly applicable to cartographic design. Eventually these may form a foundation upon which new approaches to the problem may be based. Meanwhile, they shoud assist the cartographer in coping with new problems and lead him to question some of the prevailing customs and conventions in cartography.

The psychologist tells us that, generally speaking, all men carry in their minds some sort of a mental map or schema which constantly relates their present position to other paths and places in a spatial relationship. They suggest that the map (chart) is a graphic representation of such a schema, rendered more accurate by the techniques of surveying.[11] Furthermore, if it were possible always to correlate the mental schema and the graphic representation, there would be few cases of "disorientation." One who has become disoriented has received conflicting or erroneous stimulations either from his senses or from his orientation "aids."

It appears now that the process of remaining oriented on a map or chart in guided locomotion in time (navigation), is probably a much more complicated process than orienting to an educational wall map.

[9] *See* Williams, *op. cit.*, In abstract of article.

[10] *See* Siebert, Erhardt A. and Dornbach, John E., "Chart Altitude as a Function of Hypsometric Layer Tints," *Navigation*—Journal of the Institute of Navigation, Vol. 3, No. 8, June 1953, pp. 270–274.

[11] *See* Griffin, *op. cit.*, p. 381.

Thus, stimulations received from the map surface which provide vicarious orientation-experiences for the student in learning about a place, may not be those which would be essential to the navigation needs of a pilot or airman flying over the same area. The airman obviously requires a much different type of information from the terrain presentation than does the student.

The problems of coping with the highly specialized requirements of aeronautical charts are today helping create a reawakening in the search for principles and concepts of cartographic design. Designers of aircraft cockpit instrument dials, counters, and equipment are providing the aeronautical chart engineer designer with a fruitful field of search. If we substitute a cartographic inference for the aeronautical in the following exerpt from a recent address to the Institute of Aeronautical Sciences, this reawakening of scientific investigation is symptomatic of progress in aeronautical chart development. "Without a steady increase in scientific knowledge, the art of aircraft (cartographic) design would become stagnant; supported by a vigorous scientific activity in aeronautical (cartographic) research, the art of design will flourish." [12]

The indicated approach for interested geographers and cartographers would be to concentrate on the specifics of each situation in which maps are to be used. Study the representations on the map surface, not as drafted lines, dots, and colors, but as stimulations which form a perceptual framework of information for the user in his situation. Study the stimulations necessary for the perception of space, for the perception of the third dimension on a flat surface, and all others which may provide a foundation upon which to base principles of cartographic design. This is where Karl Peucker started and this is where aeronautical charting requirements have led cartographers of today.

[12] *See* Dryden, Hugh L., "Aeronautical Research and the Art of Airplane Design," *Aeronautical Engineering Review*, Dec. 1954, pp. 40–43.

Refresher Course for Surveyors

The Extension Services and the Department of Civil Engineering of The Pennsylvania State University sponsored a Refresher Course for Surveyors at University Park, Pa., February 13–16, 1956. Approximately 150 registered for the course, and those in attendance ranged from practicing land surveyors to specialists in large mapping organizations. ACSM members Lawrence Perez and Harmer A. Weeden were actively in charge of the course and the attendant exhibits. A small unattended exhibit of ACSM material; copies of SURVEYING AND MAPPING, reprints, application blanks, etc., was on display during the four-day session.

Lefax Technical Data Catalog for 1956

A newly revised catalog of Pocket Size Technical Data Books is announced by Lefax Publishers. These handy reference books cover every branch of engineering and are comprehensive and authoritative. They are designed for the use of engineers, teachers, students, technical workers and practical men. Each book contains approximately 140 pages of data including current advances. There are about 50 different books in the series. Those which might well be of most interest to readers of SURVEYING AND MAPPING are the following:

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The Party Chief's Dilemma

(A Message for Management)

By WM. F. WARFIELD

LICENSED STATE LAND SURVEYOR
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Today's surveyor no longer runs a one-man show. Time is not too distant when the term "survey party" was unknown. Until recent years the surveyor had to direct and supervise personally every phase of the surveying as well as to be his own instrumentman and recorder. The chainmen were any two characters, usually entirely inexperienced, who were available at the site of the survey. It was also usual to have a large following of interested spectators who expressed willingness to "pull the chain," "tote the axe," and get in the way in general.

With the increasing population and rising land values, surveying has constantly become more complex. It is quite different today from the day when the surveyor ran a straight line from corner to corner. With the greater need for accuracy and skill becoming manifest, the organized survey party was created. Today this is a team of skilled co-workers and truly a professional institution.

For workable efficiency a survey party today consists of a minimum of four members. In order of chain of authority, job classification, and scale of pay, these members traditionally are a party chief, an instrumentman, a head chainman, and a rear or "tail" chainman. Job importance, please note, is not mentioned above.

Conventional practice of classifying the instrumentman next to the highest man in responsibility and pay in the party is not in accord with actual job importance. Such rank is purely a misnomer and furthermore is unfair to the next classification. This is the very point I want to emphasize.

The mistaken idea of the importance of the instrumentman has stemmed from the time when "the surveyor" was the only man in the community with a compass or transit and the closely guarded secret of how to "run" these instruments. People, and businesses too, acquire the idea, that has persisted even until today, that the instrumentman is the key man in the party. This is not now true. In this modern age need you be reminded that many large locks are manipulated with very small keys?

The running of a transit does not require any highly technical skill or knowledge. Any high school graduate can be taught in "three easy lessons" all that is needed to be known about turning all angles of the horizon. Essentially that is all an instrumentman ever does in a survey party today. On the other hand it is not that simple for the chainmen. They must learn and know a good many things. In fact, it takes not weeks or months but years to train a man to be an alert and dependable chainman.

The party chief is the surveyor. As a surveyor he must possess that peculiar power of knowing how and where to look for and tie in identifying objects and points and lines, original and occupied. In a four man party, he must record all this work in the field book. Undoubtedly his responsibility is great and his duties manifold. All this investigation and work takes place at the head-of-the-line—the "business end" of the surveying. Here with him is the head chainman: certainly the party chief's right-hand man and first assistant. It is the head chainman's job and responsibility to recognize and then properly and accurately to tie in all items under search. With the able assistance of the rear chainman, all this is accomplished at the head-of-the-line, while far back down the line, the instrumentman

stands alone with his transit and angles—and perhaps his curiosity.

The notes *must* be recorded at the "business end." At numerous times the party chief's presence is demanded elsewhere. Then of necessity the head chainman falls heir to this additional responsibility. This all adds up to the fact that it is the man at the head of the chain, not the one back at the "gun," who knows more about the immediate job. In this position of knowledge and resourcefulness the head chainman's efforts definitely add far more to the accomplishment of the work than do those of the instrumentman. Without question, it follows then that he is the most logical man to "take over" in the total absence of the party chief. Such position of job importance and responsibility should be acknowledged concretely and officially. Consequently it is my contention that the chain of command and rank, so to speak, in present survey parties should be modified. Such revision proposes the transposition of the instrumentman and head chainman in classification and pay.

I realize that, especially in firm- or company-organized parties, this propposal may present somewhat of a personnel dilemma for management. I do not here propose an answer to such a problem. Surely though, there is a solution. Certainly the title of instrumentman sounds more glamorous than that of head chainman. Perhaps the position of head chainman could be glorified with the title of assistant party chief.

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Maps Showing Yorktown Siege Given Fort Belvoir by French

By JOHN STEPP

One of the world's most historic "bread and butter" letters has brought Fort Belvoir original maps of the Revolutionary War's climactic battle of Yorktown and a contemporary account of the siege.

The gifts came as a token of appreciation from Maj. Gen. Robert Pinson, chief of the French engineers.

Earlier this year, Gen. Pinson was visiting in the United States and was invited to Belvoir's Army Engineering Center by Maj. Gen. Louis W. Prentiss, commanding officer, for a three-day grand tour.

One of the highlights was a special exhibit of the museum's French military relics.

EXPRESSION OF PLEASURE

So pleased and impressed with the whole visit was the French engineer chief that back home the following month he wrote Gen. Prentiss:

"In remembrance of my stay and the hearty welcome that you yourself gave me, would you please accept for the museum the original manuscripts about the siege of Yorktown, Virginia.

"Let this record of the siege be the token of our old and unfailing friendship."

The documents concern the climatic battle of the revolution—the siege of Yorktown, September 30 to October 17, 1781, when Washington, Rochambeau and Lafayette pinned Lord Cornwallis in the port city and pounded him into submission with heavy artillery.

The papers, gifts of the French engineer chief, include three maps showing the disposition of the French and American troops and their siege "parallels," the lines of entrenchments which throttled the British in Yorktown.

The maps—accurate and carefully detailed—were in all probability prepared under the supervision of the French general, Louis le Begue du Portail, Gen. Washington's chief engineer.

The fourth item is the hand-written account of the 18-day siege prepared by the chief of the French engineers on the scene, de Querenet de la Combe, just after the surrender.

174 YEARS IN FRANCE

Since all the documents were the work of Frenchmen, they have reposed these 174 years in the French archives.

They are soon to be placed on display in the Engineer Center Museum at Belvoir. There, according to Raleigh B. Buzzaird, curator, they will rank with the most important exhibits on hand.

Actually there is a fifth document among the new acquisitions. It is an identical report penned by de Querenet on the Yorktown siege.

"Querenet probably had to write two copies for his government, just as we have to make 14 carbons of everything for ours," Mr. Buzzaird said.

The papers, moreover, would have been ready for exhibit sooner had it not been for the fact that the old French employed by the chroniclers drove the translators into ancient French dictionaries.

* * * * *

This is a part of an article which appeared in *The Evening Star,* Washington, D.C., November 16, 1955, and is reprinted by permission.—EDITOR.

Plane Coordinate Intersection Tables

Announcement has been made by the Coast and Geodetic Survey, U. S. Department of Commerce, of the publication of two more of the series of plane coordinate intersection tables. The States covered by these latest publications are Maine (Special Publication No. 339, 45 cents) and New Hampshire (Special Publication No. 340, 25 cents).

The tables contain plane coordinates for 2½-minute intersections within the limits of the State, based on the plane coordinate system established by the Coast and Geodetic Survey.

Copies of these tables may be obtained at prices quoted above from the Superintendent of Documents, Washington 25, D. C.

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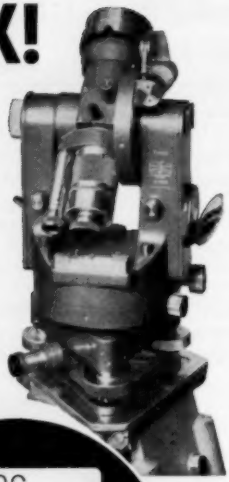

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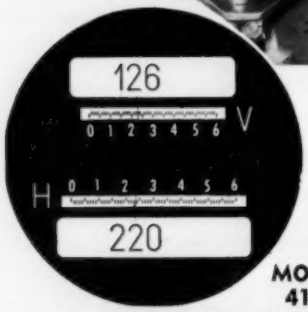

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Gurley is also distributing a small metal cord adjuster, which enables the instrumentman to make quick changes in cord length while on the job in the field.

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FROM THE MAILBAG

"I wish also to express my admiration for the magazine the Congress publishes. It is by far the most informative text written on surveying and mapping that I have seen, aside from an actual textbook. I look forward to its coming every third month and wish it were more frequent."

Additional Audio-Visual Aids

By KENNETH S. CURTIS

PURDUE UNIVERSITY, LAFAYETTE, INDIANA

This listing of films on surveying and mapping, compiled by the Chairman, Visual-Aids Committee, Education Division, ACSM, serves as a supplement to the original compilation previously published in SURVEYING AND MAPPING.[1] Individuals, companies, and agencies are asked to contact the Visual-Aids Committee, Education Division, ACSM, when new films are prepared and issued.

Property Lines.—B&W, 22 min., sound, 1953, rent, University of Southern California. The purpose of the film is to acquaint the lay people with the responsibilities of the land surveyor. It is "the story of the land and the lines that divide the land for ownership" and traces the development of surveying from "rope stretchers," re-establishing boundaries erased by the flooding Nile, to two neighbors in modern Los Angeles disputing their boundaries. One, baffled in the attempt to survey his own lot, calls in a professional land surveyor, who helps them reach a friendly solution.

Tides and Currents.—Color, 18 min., sound, 1955, free, U. S. Coast and Geodetic Survey. The film describes the scientific explanation for the tides and currents in nature and the way in which they affect our lives. The method of measuring and predicting tides and currents is reviewed.

Wire Dragging.—Color, 15 min., sound, 1954, free, U. S. Coast and Geodetic Survey. The film depicts one of the methods used in conducting hydrographic surveys.

Charting Activities of the U. S. Lake Survey.—Color, 30 min., sound, 1953, free, U. S. Lake Survey. Shows all phases of work done in the preparation of navigation charts—including field surveys, office compilation, engraving, processing, printing, and hand correction of aids-to-navigation on the printed charts. River flow measurement for hydraulic studies is also shown.

The Making of Aeronautical Charts.—Color, 15 min., sound, 1953, free, U. S. Lake Survey. Illustrates the complete process of producing an aeronautical chart. Shows receipt of source material and shows the ensuing steps through the compilation stage and the editing process. The final drafting or color-separation process is followed through, along with the photographic steps used in making proofs before the final printing.

Surveying With Kytoon.—Color, 18 min., silent, 1947, free, Little Rock District, Corps of Engineers. Shows a method of triangulation surveying using Kytoons (helium-inflated balloons) and two-way communication.

The Last Word in Surveying Instruments.—Color, 20 min., sound, 1955, free, Kern Instruments, Inc. Shows the manufacturing and use of Kern-Swiss optical-reading surveying instruments. The film includes beautiful photography of some choice Swiss scenery and English narration.

First in a Hundred Years.—Color, 25 min., sound, 1953, Brunson Instrument Co. Brief comparison of the standard type of American instrument and the Brunson ball-bearing instrument. Shows field stripping and reassembly of the ball-bearing base and also shows the complete assembly from the very beginning.

Optical Tooling.—Color, 30 min., sound, 1955, free, Brunson Instrument Co. A scientific engineering explanation of how to use the principles of optical tooling in industrial applications.

Aerial Mapping Surveys.—Color, third dimension, 25 min., sound, 1952, special arrangements with Robert A. Cummings & Associates. The film describes the technique involved in compiling planimetric and topographic maps from aerial photographs. Film requires special techniques in showing, because it is in third dimension and requires the use of polaroid glasses.

A Third Dimension for Oil.—Color, third dimension, 20 min., sound, 1954, special arrangements with Geophoto Services, Inc. The film describes the techniques involved in interpreting aerial photographs for geological purposes in the search for oil. Film requires special techniques in showing, because it is in third dimension and requires the use of polaroid glasses.

[1] Curtis, Kenneth S., Audio-Visual Aids in Teaching Surveying and Mapping, SURVEYING AND MAPPING, April–June 1953, Vol. XIII, No. 2, pages 220–225.

TOPOGRAPHIC MAPPING

The U. S. Geological Survey has several films dealing step-by-step with the mapping operations used in preparing the standard topographic maps. All of these training films are color, sound, and range in length from 20 to 30 minutes, except as noted. These films include:

Leveling for Topographic Mapping
Transit Traverse for Topographic Mapping
Triangulation for Topographic Mapping
Supplemental Control for Topographic Mapping
Negative Scribing for Map Reproduction
Preparation of Topographic Manuscripts for Reproduction
Topographic Mapping by Photogrammetric Methods (90 minutes)

RESEARCH AND DEVELOPMENT

The Surveying Branch of the Engineer Research and Development Laboratories, Corps of Engineers, have several films dealing with their continuing research in surveying and mapping which may be borrowed for "study purposes," but have not been cleared for public showing. These report films include:

Geodimeter Baseline Measurement (*RF-1726*) 20 min., color, sound, 1953.
Arctic Tests on Theodolites (*RF-1519*) 3 min., color, silent.
Theodolite—01 Second (*RF-1464*) 16 min., color, sound.
Vibrating Machine Tests on Theodolites and Transits (*RF-1363*) 24 min., B&W, sound.
Tower Triangulation—25 ft. (*RF-1341*) 24 min., color, sound.
Engineer Activities of Topographical Section (*RF-1091*) 10 min., B&W, silent.

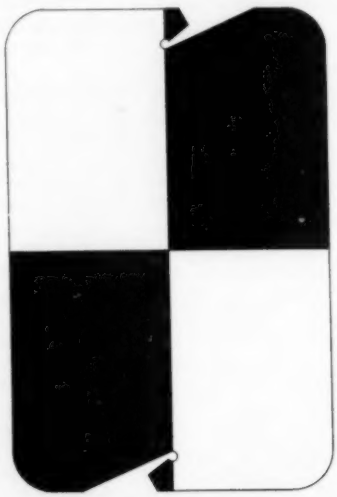
ADDRESSES

BRUNSON INSTRUMENT COMPANY, 1405 Walnut St., Kansas City 6, Mo.
FILM LIBRARY, Engineer Research and Development Laboratories, U. S. Corps of Engineers, Building 320, Ft. Belvoir, Va.
U. S. COAST AND GEODETIC SURVEY, Department of Commerce, Washington 25, D. C.
MAP INFORMATION OFFICE, U. S. Geological Survey, Washington 25, D. C.
U. S. LAKE SURVEY, U. S. Corps of Engineers, 630 Federal Building, Detroit 26, Mich.
AUDIO-VISUAL SERVICES, University of Southern California, 3518 University Ave., Los Angeles 7, Calif.
ROBERT A. CUMMINGS AND ASSOCIATES, 239 Fourth Ave., Pittsburgh 22, Pa.
KERN INSTRUMENTS, INC., 120 Grant St., White Plains, N. Y.
GEOPHOTO SERVICES, INC., 305 Ernest and Cranmer Bldg., Denver 2, Colo.

Simple Homemade Target

An ingenious method of making a sighting target to fit on a plumb-bob cord has been suggested by Robert B. Irwin, of Los Angeles. He forwarded one of the targets to the chairman of the Publications Committee who, in turn, forwarded it to the editor of SURVEYING AND MAPPING. The accompanying drawing was made up from the target itself.

These targets may be cut from the obvious portion of the side of a one-quart Texaco oil can. The small holes, 1/16 inch in diameter, should be centered exactly on the centerline of the target. The rest of the work may be done with tinsmith's shears. The result is a very practical and lightweight target suitable for most practical purposes. The blank, as it is cut from the side of the can, is *red* and white. Otherwise it is exactly like the drawing. The drawing is the same size as the finished target.



La Gorce Golden Anniversary

On November 16, 1905, John Oliver La Gorce joined the staff of the National Geographic Society. On November 17, 1955, after completing fifty years of continuous service with that organization, the Board of Trustees of the Society honored him with the "Grosvenor Medal." This was presented at a dinner at the Chevy Chase Club, Chevy Chase, Md., at which some three hundred of his friends and associates were present.

When young La Gorce joined the staff of the National Geographic Society, it published a rather slim but scholarly journal which went to a few thousand members, mostly professionals interested in geography as an abstract science. Today the National Geographic Society has a membership of well over two million. Its staff, which jumped from two to three when La Gorce joined the organization, now numbers some nine hundred employees. This phenomenal growth is due chiefly to the teamwork of Dr. Gilbert Grosvenor and Dr. John Oliver La Gorce.

La Gorce came to the National Geographic Society from the newspaper field. He was an expert press telegrapher. His energy and ideas, complementing the able editorial leadership of Dr. Grosvenor, were in great measure responsible for the fact that the "National Geographic" has become a household word, not only in the United States but throughout the world.

Dr. La Gorce has always been keenly interested in maps and mapping. The ten-color map supplements which arrive from time to time with issues of the *National Geographic Magazine* are evidence of this. Since 1899 the Society has published 136 of these large map supplements and in such sizable editions that over 155 million separate sheets have been distributed. Practically all of this enormous map production has come about during the half century that Dr. La Gorce has been with the Society.

He joined the staff as assistant secretary and later became assistant editor of the magazine. He became associate editor in 1911, vice president in 1920, and, in 1954, was elected president of the Society and editor of its magazine, when Dr. Grosvenor retired from both of these positions.

La Gorce has been awarded honorary degrees by the University of Lima (Peru), both Georgetown and George Washington Universities, South Dakota School of Mines, University of Tampa, Oglethorpe University, and the University of Miami (Florida).

JOHN OLIVER LA GORCE

He is a fellow of the Royal Geographic Society of Great Britain, a chevalier of the French Legion of Honor, and an honorary member of the Geographical Society of Lima. In 1948 he became the third recipient of the Henry Grier Bryant Medal, presented by the Geographical Society of Philadelphia. In 1955 he was one of five outstanding journalists and editors of the Western Hemisphere to win Columbia University's Maria Moors Cabot award for furthering friendship between the peoples of the Americas.

Dr. La Gorce has traveled much and has published numerous articles in the *National Geographic Magazine*. He is an authority on fishing and sea life and edited the Society's well-known "Book of Fishes."

In Antarctica, a mountain range, a peak, and the meteorological station established by the First Byrd Antarctic Expedition were named for him. Maps of Alaska show another mountain, a lake, and a glacier bearing his name. La Gorce Arch is one of the spectacular formations along the Escalante River in Utah.

An unusual distinction came to Dr. La Gorce

in 1933 when he was appointed postmaster of Little America, Antarctica, a post office that was created for the Byrd Antarctic Expedition that carried thousands of letters for cancellation at the world's southernmost United States post office.

Trip-Finders

"Believe it or not," your editor discovered these ingenious little "gimmicks" by means of a short item in *Better Homes and Gardens*. He wrote to the publisher for samples, now has one before him, and will attempt to describe it. If he succeeds, it will be a nice job of descriptive writing.
—EDITOR

These novelty maps, published by Sayles-Wilson, Inc., 527 W. 39th St., Kansas City, Mo., make use of an idea which, according to information furnished, was first used by the Royal Dutch Airlines to show distances between airports.

Each of the 16 maps in the complete set covers only a relatively small section of the United States—the one in hand covers New York, Pennsylvania, and New Jersey. The maps are printed on the outside of open-end envelopes. The same map appears on both the outside faces of each envelope. The envelopes are open at the bottom end or at the south edge of each map. The maps are printed in colors.

If the one for New York, Pennsylvania, and New Jersey is described in detail, the description may well serve for any of the other 15 maps in the whole set.

The envelope is 3¾ inches wide and 5½ inches long. The maps on its two outside faces are each 3½ inches wide and 4⅛ inches in length. This leaves a space at the upper or north edge of the map, about 1¼ by 3¾ inches in size, in which may be printed the name of the individual, firm, or organization which purchases them in quantity for advertising purposes.

Each map has 28 little rectangular windows —somewhat like the holes in an I.B.M. tabulating-machine card, only more nearly square and with the long dimension horizontal rather than vertical. There is also a bigger window "up in Canada" on the map.

Inside the envelope is a card which fits well but not tightly enough to interfere with its movement in and out of the envelope. On both sides of the card there are printed tables of figures, with small black dots at appropriate places among the printed numbers.

With the card shoved all the way in, a black dot appears in the little window near Albany, and the name "Albany" appears in the big window. Then, in all the other little windows near the principal cities in the three States, the figures appearing there show the highway mileages between each of the cities and Albany.

With the card left in the same position and the envelope turned over, we find the black dot at New York and "New York" appearing in the large window in that side of the envelope. Thus mileages between New York and the other 27 cities having windows are all displayed at once.

Now, if we pull the card out approximately a tenth of an inch, "Philadelphia" appears in the big window, the black dot appears in the little window near Philadelphia, and the figures in the other little windows are the mileages between Philadelphia and the other cities near all the other little windows. Withdraw the card another tenth of an inch and the mileages which show in the little windows are between those cities and Pittsburgh, the black dot shows in the Pittsburgh window, and "Pittsburgh" shows in the big window.

By using both sides of the thing, mileages from each of the 28 cities to each of the other 27 cities can be determined. It surely must have required some nice planning to assure that the correct mileage will always pop up in the appropriate window.

The place names appear in alphabetical order in the big windows—Altoona to New Castle on one side and New York to Williamsport on the other—as the card is pulled out, so the black dot can be quickly spotted in any desired one of the little windows.

Instructions for operating the gadget are printed on the card. Highway route numbers between the various cities are shown on the map.

Furthermore, because the two maps on the outside of the envelope are identical, the gadget still operates properly even if the card is pulled completely out of the envelope and turned over before it is put back. Apparently, as long as the names and figures come right-side-up in the windows the readings will be correct.

The Geologist's Curse

or

The Case of the Out-of-Print Map*

The following editorial is reprinted with the permission of the *Geological Newsletter*. While this is aimed primarily at geologic maps and reports which are out of print, the same sort of thing occurs all too frequently where topographic maps are involved. How many times have engineers experienced a sense of frustration when having to plan with the aid of out-of-date maps or even no maps at all?

—EDITOR

"Without question thousands upon thousands of geologist-days of effective work are wasted each year because of the out-of-print map. The cost of tracing, photostating or otherwise reproducing out-of-print maps and reports would certainly support a lot of basic field work. The most obvious offenders in the case of the extinct geologic literature are the state and federal surveys. How does the situation come about? In many cases poor planning fails to anticipate the need for a geologic map or report. In other cases an unfortunately large number of an edition fall into inappreciative hands and are lost. Then there are unforeseen developments, such as mineral booms, which quickly absorb all available reports and create unexpected demand.—So we have reports out-of-print, what to do about it?

"It is natural that the surveys are reluctant to reprint these unavailable maps, for they are invariably out-dated and in need of revision. The press of new work and the general limits of appropriations in most instances cause such revision projects to be shelved until tomorrow. Tomorrow is often measured by geologic time standards, so the profession struggles on without the map or report while revision plans languish.

"The geologic map is one of the most important tools available to the geologist. Is it not logical, therefore, that the practicing geologist concern himself with the problem of what to do about the out-of-print geologic map and report? A centralized committee to evaluate demands for out-of-print literature and to facilitate reprinting of needed maps could be of great assistance in a solution of a knotty problem of the profession."

* Geologic Map.

Stages and Discharges of the Mississippi River

Publication of the book "Stages and Discharges of the Mississippi River and its Outlets and Tributaries, 1954" has been announced. The publication includes tabular data giving the record highest and lowest stages of the Mississippi River and tributaries. This 290-page publication also contains detailed stream gaging records for 1954, including daily gage records and daily observed river discharge records at stations operated by Corps of Engineers districts and other agencies and firms.

Most of the data included refer to the Lower Mississippi River—from Cairo to the Gulf. However, records are also included for the Upper Mississippi River to Aitkin, Minn., for the Illinois River to Peoria, Ill., for the Missouri River to Kansas City, Mo., and for the Ohio River to Pittsburgh, Pa. Some records are included for the Wabash, Cumberland, Tennessee, St. Francis, White, Arkansas, Red, Ouachita, Atchafalaya, Obion, Hatchie, Loosahatchie, Wolf, Yazoo, and Big Black Rivers.

The publication is paper bound and may be obtained from the Office of the President, Mississippi River Commission, P. O. Box 80, Vicksburg, Miss., at the price of $1.00 per copy. Remittances should be payable to the Treasurer of the United States.

One Hundred Topographic Maps Illustrating Specified Physiographic Features

As aids to teaching physiographic features of the United States, the topographic quadrangles published by the U. S. Geological Survey are unexcelled. High school and college teachers will, therefore, welcome the news that the Survey, after a lapse of some years, is again offering a selected "Set of One Hundred Topographic Maps Illustrating Specified Physiographic Features."

With a protective folder, and an index map of the United States (with boundaries of physiographic regions) the 100 map set is available for $15 from the Survey's distribution offices in Washington, D. C. and Denver, Colo. A twenty-five map set, designed for more limited study, is priced at five dollars.

The 100 maps, assembled by William Upton, Jr., have been selected to illustrate a wide variety of physiographic features. At least one representative map is included for each of the eighty-six subdivisions outlined on the Physical Divisions Map of the United States.

On the verso of the index map the physiographic features, portrayed on the quadrangles, are listed and summarized. In one list features are arranged alphabetically by states under the quadrangles on which they appear. In a second list the quadrangles are grouped under the categories of physical features included within their boundaries.

Some users of the set may regret the omission of the summary descriptions of physiographic types which accompanied selections of quadrangles offered for sale by the Geological Survey prior to World War II.

The extensive post-war mapping activities of the Survey are evident in the new list of maps. Two-thirds of the quadrangles were published within the past ten years. Less than a fourth are dated before 1940.

More than half the quadrangles are at the scale of 1:62,500, a third are on the enlarged scale of 1:24,000, and ten per cent are at 1:31,680. The scale of 1:48,000 is used for one map. Four quadrangles are at smaller scales, three at 1:125,000, and one at 1:250,000. Ten maps are in attractive and colorful shaded relief. By overprinting shadow patterns on the contour base, the relief is given a third-dimension quality without reducing the clarity of important details.

Aerial photographs are available for most of the areas covered by the maps in this selected set.

—Walter W. Ristow
Library of Congress

Texas Surveyors Adopt Official Emblem

A copy of *The Texas Surveyor* (Vol. 2, No. 1, January, 1956) has arrived at the editorial office of Surveying and Mapping. With it there was an interesting sheet announcing that the Texas Surveyors Association has approved an "official membership emblem." The sheet shows sketches of the emblem as it appears on a lapel pin, a charm, a tie bar, a cigarette lighter, and on cuff links.

The remarkable feature is that transits must be enormously large in Texas, or the State is not as large as some would have us believe. The emblem is in the shape of a map of the State of Texas, but the conventionalized transit superimposed on it is so big that the telescope extends from the vicinity of Denison to a point well to the northwest of Amarillo and the leveling screws just about fit in between Del Rio and San Antonio.

New Buildings for USC&GS and USGS

In the column "The Federal Diary" in the *Washington Post and Times Herald* for February 15, 1956, announcement was made that plans are well advanced for the construction of a new building in an outlying area to house the U. S. Coast and Geodetic Survey and the U. S. Weather Bureau.

It was also announced that the U. S. Geological Survey is to have a new building and that a new electronic computer of medium size is to be installed this summer in the present USGS offices. The computer will enable the Geological Survey to increase production.

United States Navy Hydrographic Office Celebrates 125th Anniversary

On December 6, 1955, the Hydrographic Office of the United States Navy completed 125 years of service. Known by its present name only since 1866, the organization is the outgrowth of the Navy's "Depot of Charts" established in 1830.

In 1837 a lithographic press was installed in the Depot and the first nautical chart printed by the Navy was published in that year.

Congress authorized the construction of a new building for the Depot in 1842, and Lieutenant Mathew Fontaine Maury was assigned as Officer in Charge. Maury appealed to all shipmasters to report pertinent information concerning winds, weather, and currents along the ocean routes.

The year 1847 saw the publication of the first *Wind and Current Chart of the North Atlantic,* which was based on millions of reports received in response to Lieutenant Maury's appeals.

In 1853, at the instigation of the United States, an international conference was held, to interest other nations in the exchange of nautical information. Lieutenant Maury's plan was adopted by all of the maritime countries.

The Depot was officially designated "U. S. Naval Observatory and Hydrographic Office" in 1854, but an act of Congress in 1866 separated the Hydrographic Office from the Naval Observatory. The Hydrographic Office moved to new quarters and its functions were considerably broadened.

The first *Notice to Mariners* was published in 1869. The U. S. Board of Geographic Names stemmed from a proposal by the Hydrographic Office in 1889.

The International Ice Patrol, organized after the sinking of the *Titanic,* is an international project in the organization of which the Hydrographic Office played an important part.

The year 1912 also saw nautical charts printed in colors for the first time.

During the last three or four decades the Hydrographic Office has expanded greatly and its accomplishments have become too numerous for detailing in a brief article such as this.

The above information and a great deal more of much interest may be found in an illustrated 26-page brochure recently published by the organization, under the title "125th Anniversary United States Hydrographic Office."

TVA Mapping Activities

The following is quoted from the Annual Report of the Tennessee Valley Authority for the fiscal year ended June 30, 1955.—Editor.

Military mapping for the Army Map Service continued during fiscal year 1955 at about the same volume as in the two preceding years, but the Valley mapping program was sharply retarded because of budgetary limitations.

For the Army Map Service, mapping at various scales covered parts of 12 different countries and will comprise 478 sheets. Work continued on maps of military reservations and other strategic areas in the United States, with 51 sheets drafted and edited and fieldwork completed on 17 sheets during the year. TVA is reimbursed for this service.

At the close of the fiscal year, 74 percent of the 765 quadrangles in the Valley mapping program had been published in five-color lithographic form. Twenty-one were published during the year.

Public demand for the maps continues to increase. They are used for many purposes, such as industrial development, roads, and schools. The maps are essential to TVA in its planning studies on flood control, transmission line locations, coal sources, tributary watershed developments, communications facilities, and other activities.

The maps are part of the nationwide mapping project being carried on by several Government agencies. They conform to national map standards.

No Grids for St. Peter

When the last observation is taken
The theodolite's back in the box,
The observer is coffined up also
His soul at St. Peter's gate Knocks.

The observer not quite understanding
That of all earthly troubles he's rid
Says "St. Peter, come over and tell me
What projection you use and what grid."

Then St. Peter replies with a twinkle,
"There's no need to fuss about that.
Projections and grids don't concern us.
Ain't you 'eard? This is Heaven—it's flat."

—J. C. T. WILLIS

The verses above were written by Major General J. C. T. Willis, Director General, Ordnance Survey Office, England, and were called to the attention of the Chairman of the Publications Committee by Colonel Gerald FitzGerald. Mr. Whitten wrote to General Willis requesting permission to publish the verses in SURVEYING AND MAPPING. The letter granting this permission is given below. When you have read it, we think you will agree that we might do well to attempt to induce General Willis to become a regular contributor to our journal.

—EDITOR

Dear Mr. Whitten:

Many thanks for your letter of the 31st January. I am quite overwhelmed by your kindly remarks about my few verses. I have been called many things in my time, but never before has anyone made the assumption that I am a poet. I propose on this basis to grow my hair long, wear claret coloured corduroy trousers, and a large floppy tie.

By all means use the verses in any way you like. You are more than welcome.

It is just possible that you may want something else as a fill-in, in which case, puffed with pride as a result of your letter, could I suggest the following:

Last year a group of hikers, on a lonely moor on a hot summer's evening, walked for many miles to a cross-roads at which the word "INN" was marked upon one of our 1" maps. On arrival there they found that the map was out of date, and the Inn had been removed some years previously. Such was their emotion that they wrote to me a long formal complaint, couched entirely in verse, and underlining their bitter disappointment. The answer went back to them on very formal notepaper, as follows:

"The Ordnance Survey is the first
To deplore an unslaked thirst.
But the next time, without a doubt
You'll find the absent Inn is out."

On a more serious note, thank you very much for your letter. I do feel that if one can raise a smile or two in this somewhat drab world, no harm is really done!

New Mapping Booklet

Mapping by use of aerial photography and photogrammetry and the equipment used in this work are explained and illustrated in a new 8-page brochure "Serving the Engineering Profession."

The booklet includes examples of topographic maps of one-foot precision, planimetric maps, photographic mosaic maps, and plan and profile sheets as products of the airborne camera.

A copy will be mailed upon request by Abrams Aerial Survey Corporation, Lansing 11, Mich.

Nolan Heads Geological Survey

Dr. Thomas B. Nolan, appointed by President Eisenhower to succeed Dr. William E. Wrather as Director of the United States Geological Survey, was sworn in at a ceremony in the office of Secretary of the Interior Douglas McKay on January 27, 1956.

Dr. Nolan, who has been Assistant Director since December 1944, is a native of Greenfield, Massachusetts, a graduate and Ph.D. of Yale University, and has been a career Civil Service employee since his appointment as a junior geologist in 1924.

A member of the National Academy of Sciences and the American Academy of Arts and Sciences, he received the Spendiaroff Award of the XVI International Geological Congress in 1933, and, "for meritorious achievement in advancing the science of tungsten" the K. C. Li Gold Medal and $1,000 Prize in 1954.

Between 1925 and the late 1930's Dr. Nolan mapped several mining districts in Utah and Nevada including Gold Hill and Tonopah. Later he was given the assignment of planning and organizing the Survey's studies of all tungsten deposits in this country.

Dr. Nolan is a past president of the Society of Economic Geologists and a member of many scientific and professional organizations, including the Geological Society of America, Mining and Metallurgical Society of America, Geological Society of Washington, American Geophysical Union, American Society of Photogrammetry, American Ornithologists Union, the Explorers Club of New York and the Cosmos Club of Washington, and ACSM.

Dr. Wrather, who is retiring, first joined the Survey for the summer of 1907 and later rejoined when he was appointed Director in 1943. He has guided the activities of the Geological Survey through 12 years of growth in service to the Nation during the difficult years of war and the latter period of adjustment to an expanding economy.

Dr. THOMAS B. NOLAN

Dr. Wrather is well known to scientists and petroleum men everywhere for his pioneering applications of geology to the underground search for oil; for his discovery of the Desdemona oil field in Comanche County, Texas; and for his war-time service with the Metals and Minerals Division of the Board of Economic Warfare.

In 1950 Dr. Wrather was awarded the Anthony F. Lucas Petroleum Medal of the American Institute of Mining and Metallurgical Engineers, and in 1950 the 50th John Fritz Medal, highest engineering award in this country.

Election Results

Under date of January 16, 1956, A. C. Kalbfleisch, Chairman of the Tellers Committee, reported to Executive Secretary Dix that 1,087 ballots were received and that the results of the election were as follows:

President—Lester C. Higbee

Vice President—G. W. Herzog

Director for one year (1956) to fill Past President's constitutional directorship—William C. Wattles

Directors (1956–57)—

Bro. B. Austin Barry

S. P. Chapman

Kenneth S. Curtis

Robert O. Davis

Victor H. Ghent

Surveying and Mapping News

Members are requested to send in surveying and mapping news items for publication in SURVEYING AND MAPPING.—EDITOR.

CURRENT SURVEYING AND MAPPING LITERATURE

MAGAZINE ARTICLES

General Interest

BORNEO—THE LAND BELOW THE WIND. F. G. Perkins. *The New Zealand Draughtsmen's Journal,* Vol. 2, No. 13, July 1955. (Some background information on Borneo and a general discussion of the work of its survey department.)

SOME LOCAL SCHOLARS WHO COUNSELLED THE PROPRIETORS OF PENNSYLVANIA AND THEIR COMMISIONERS DURING THE BOUNDARY SURVEYS OF THE 1760'S. Thomas D. Cope. *Proceedings of the American Philosophical Society,* Vol. 99, No. 4, August 30, 1955. (Scholarly historical discussion.)

SPECIALIZATION—WHERE SHOULD IT BEGIN AND END? John V. Buley. *The Australian Surveyor,* Vol. 15, No. 7, September 1955. (Philosophical discussion of the functions of surveyors.)

TUNNEL CROSS SECTIONS BY PHOTOGRAPHY. D. N. Hillan. *The Australian Surveyor,* Vol. 15, No. 7, September 1955. (Describes methods of approach to a difficult surveying problem in connection with the Snowy Mountains Hydroelectric project.)

PAPUA'S FIRST SURVEYOR. S. E. Reilly. *The Australian Surveyor,* Vol. 15, No. 7, September 1955. (Interesting history.)

AERIAL PHOTOGRAPHY AND PROPER LAND UTILIZATION. V. C. Robertson. *The Photogrammetric Record,* Vol. 1, No. 6, October 1955. (Discussion of land use problems and the use of aerial photography in their solutions.)

THE USE OF AIR PHOTOGRAPHS IN SOIL SURVEY. Dr. A. Muir. *The Photogrammetric Record,* Vol. 1, No. 6, October 1955. (Discussion of basic soil types in connection with photographic interpretation.)

THE GEOGRAPHICAL INSTITUTE OF GOTHA, GERMANY. Erwin Raisz. *The Professional Geographer,* Vol. 7, No. 6, November 1955. (Thumbnail history of the Justes Perthes geographic-cartographic institution now known as the VEB Geog.-Cartographic Institute.)

SEVEN MODERN WONDERS NAMED. J. Kip French. *Civil Engineering,* Vol. 25, No. 11, November 1955. (Concise descriptions of the structures selected by the ASCE as the outstanding marvels of civil engineering in the United States.)

THE MACKINAC BRIDGE—CONQUERING THE IMPOSSIBLE. D. B. Steinman. *Transactions of the New York Academy of Sciences,* Series II, Vol. 18, No. 1, November 1955. (Describes the planning and undertaking of the construction of one of the largest bridges in the world.)

APPLICATION OF RADIO AIDS TO HYDROGRAPHIC SURVEYING. (No author given.) *The Nautical Magazine,* Vol. 174, December 1955. (Discussion of survey methods using the Decca Navigator system.)

THE ENGINEER SURVEYOR. A. J. Rusk. *Empire Survey Review,* Vol. 13, No. 99, January 1956. (A thought-provoking article on the advisability of training and using surveyors having an engineering background, during both preliminary and construction phases of work on large construction projects, rather than having the surveying done by engineers with surveying backgrounds.)

Cartography

AN UNKNOWN CHAMPLAIN MAP OF 1616. Lawrence C. Wroth. *Imago Mundi,* Vol. 11, 1954.

A CURIOUS FEATURE ON EARLY MAPS OF MALAYA. Paul Wheatley. *Imago Mundi,* Vol. 11, 1954.

CATALAN PORTOLAN MAPS AND THEIR PLACE IN THE TOTAL VIEW OF CARTOGRAPHIC DEVELOPMENT. *Imago Mundi,* Vol. 11, 1954.

SOME EARLY MAPS RELATING TO FLORIDA. David O. True. *Imago Mundi,* Vol. 11, 1954.

A CIRCULAR, COPPER-ENGRAVED, MEDIEVAL WORLD MAP. Erich Woldan. *Imago Mundi,* Vol. 11, 1954.

CHINESE COASTAL MAPS. J. V. Mills. *Imago Mundi*, Vol. 11, 1954.

EXPLORERS' MAPS; JAMES COOK AND THE MAPPING OF THE PACIFIC. R. A. Skelton. *The Geographical Magazine*, Vol. 28, No. 2, June 1955.

RADAR CHARTING. Rear Admiral Robert F. A. Studds, Director, U. S. Coast and Geodetic Survey. *International Hydrographic Bulletin*, No. VII, July 1955. (Describes the experimental work done by the Survey in this type of charting.)

SPECIAL PAPER FOR CHART PRINTING. (No author given.) *International Hydrographic Bulletin*, No. VII, July 1955. (Describes qualities of "Texoprint," a plastic material manufactured by the Kimberly-Clark Corp., Neenah, Wisconsin.)

SURVEY DRAUGHTING IN CEYLON. Extracts from an interview with C. R. Lyon, Chief Survey Draughtsman, Wellington. *The New Zealand Survey Draughtsmen's Journal*, Vol. 2, No. 13, July 1955. (Discussion of technical assistance in drafting given to Ceylon by New Zealand under the Colombo plan and its results.)

THE OTHER SIDE. S. Cameron. *The New Zealand Survey Draughtsmen's Journal*, Vol. 2, No. 13, July 1955. (General survey of the various uses for New Zealand maps.)

MAPS. Annual Report of the Maps Division, The Library of Congress. Published in the *Quarterly Journal of Current Acquisitions*, Vol. 12, No. 4, August 1955. (For sale by Superintendent of Documents. price not shown.)

THE TASMAN MAP OF AUSTRALIA. (Author unnamed.) *Canadian Geographical Journal*, Vol. 51, No. 3, September 1955. (Description and history of a famous map now in the Mitchell Library at Sydney.)

MAPS THE BLIND CAN SEE. John C. Sherman. *The Journal of Geography*, Vol. 54, No. 6, September 1955.

DISTORTED MAPS, A TEACHING DEVICE. Chauncey D. Harris and George B. McDowell. *The Journal of Geography*, Vol. 54, No. 6, September 1955.

ARMY MAPS: ATTRACTIVE MARKET FOR LITHOGRAPHERS. Mike Geary. *Modern Lithography*, Vol. 23, No. 10, October 1955. (Describes program of Army Map Service for contracting work to provide lithographic firms and advises firms on ways to get such contracts and methods of handling them.)

"BALANCED" COLORS FOR USE ON THE MULTICOLOR DOT MAP. Edwin N. Thomas. *The Professional Geographer*, Vol. 7, No. 6, November 1955. (Technical discussion of choice of colors and variations in color intensity in the construction of dot maps.)

THE HISTORY OF THE NAUTICAL CHART. David Williams. *The Nautical Magazine*, Vol. 174, December 1955. (Brief, interesting and concise account of the development of nautical charting.)

Control Surveys

SOUTH OF THE BORDER SURVEY. Colonel R. R. Robertson. *Army Information Digest*, Vol. 10, Number 4, April 1955. (Popular discussion of the overall program for mapping Mexico, Central and South America, under the direction of the Army's Carribean Command and a description of the present work of the Inter-American Geodetic Survey.)

MEASUREMENT OF THE STANDARD BASE LINE AT NUMMELA, FINLAND. H. J. Jenks. *New Zealand Surveyor*, Vol. 20, No. 4, August 1955. (Description of the methods employed.)

THE INTERNATIONAL METRE. H. J. Jenks. *New Zealand Surveyor*, Vol. 20, No. 4, August 1955. (Comments on the history of the international metre based on the article by R. H. Field in the *Canadian Surveyor*, April 1954 and listed in this department in the July–September 1954 issue.)

A SEMI-GRAPHIC METHOD OF ADJUSTING MINOR TRIANGULATION. A. J. D. Blair. *New Zealand Surveyor*, Vol. 20, No. 4, August 1955. (Description of method for use in connection with some second and third order triangulation.)

TRIGONOMETRIC HEIGHT RESECTION. G. J. Thornton-Smith. *The Australian Surveyor*, Vol. 15, No. 7, September 1955. (Commentary on previous article by A. W. Miller offering a suggestion for improvement of what he considers a weak point.)

THE CHATHAM-DUNKIRK ROAD AERIAL TRIANGULATION. D. W. G. Arthur. *The Photogrammetric Record*, Vol. 1, No. 6, October 1955. (Account of an early experiment in survey by aerial photography.)

A NOTE ON THE CALCULATION OF POSITION LINES. P. V. Angus-Leppan. *Empire Survey Review*, Vol. 13, No. 98, October 1955. (Gives mathematical formula for suggested method.)

THE CONVERSION OF COORDINATES FROM THE CASSINI TO THE TRANSVERSE MERCATOR PROJECTION. Brigadier K. M. Papworth. *Empire Survey Review*, Vol. 13, No. 98, October 1955. (Gives formulae for the conversion in connection with a problem involving triangulation in several counties of Northern Ireland.)

TRIGONOMETRIC HEIGHTS AND REFRACTION. H. F. Rainsford. *Empire Survey Review*, Vol. 13, No. 98, October 1955. (De-

tailed description of procedure adopted by the Directorate of Colonial Surveys for obtaining trigonometric heights, with particular reference to primary and secondary chains and nets.)

PHOTOGRAMMETRY AT YOUR SERVICE. Leon T. Eliel. *Civil Engineering,* Vol. 25, No. 10, October 1955. (Discusses various utilizations of photogrammetric surveys.)

CONFERENCE OF COMMONWEALTH SURVEY OFFICERS. G. Bomford. *Nature,* Vol. 176, No. 4492, December 3, 1955. (Report on proceedings of conference held at London and Cambridge in August 1955, also attended by representatives of several other countries including the United States.)

GYRO WANDER AND MAP PROJECTIONS. Wing Commander Keith R. Greenway, RCAF. *Navigation,* (Journal of the Institute of Navigation) Vol. 4, No. 8, December 1955. (Paper presented at the Annual Meeting of the Institute of Navigation held at the Air University, Maxwell Air Force Base, June 25, 1955.)

A NEW SOLUTION OF THE INVERSE SHORAN PROBLEM. Clair E. Ewing. *Transactions, American Geophysical Union,* Vol. 36, No. 6, December 1955. (New approach to the problem which the author terms "parallel radius method.")

NET DESIGN FOR HIRAN SURVEYS. Samuel D. Owen. *Transactions, American Geophysical Union,* Vol. 36, No. 6, December 1955. (A method for computing the strength of figure of a trilateration net and an interim accuracy criterion for planning nets for first-order surveys are proposed.)

Topography

THE ACCURACY OF THE INNER ORIENTATION OF PHOTOGRAPHS IN A PLOTTING INSTRUMENT. H. C. Zorn. *Photogrammetria,* Vol. 11, No. 4, 1954–55. (Description of experiments to determine the observational accuracy of inner orientation with results in tabular form.)

A MECHANICAL SOLUTION OF THE EQUATIONS FOR RELATIVE ORIENTATION OF VERTICAL PAIRS. F. Goudswaard. *Photogrammetria,* Vol. 11, No. 4, 1954–55. (Mathematical discussion.)

PLOTTING CONVERGENT PHOTOGRAPHS IN INSTRUMENTS WITH ORTHOGONAL OBSERVATION. W. Loscher. *Photogrammetria,* Vol. 11, No. 4, 1954–55. (Essays to prove that there are no technical difficulties to prevent adaptation of a mechanical plotting instrument with orthogonal observation for plotting of convergent photographs.)

ON THE SHORAN-PHOTOGRAMMETRIC POSITION FIXING. Simo Laurila. *Photogrammetria,* Vol. 11, No. 4, 1954–55. (Demonstrates that the Shoran system can be used effectively in photogrammetry.)

A PRACTICAL PROCEDURE FOR CARRYING OUT SPATIAL STEREOTRIANGULATION. Umberto Nistri. *The Photogrammetric Record,* Vol. 1, No. 6, October 1955. (Technical discussion.)

Property Surveys

EASEMENTS. W. A. Dowd. *The New Zealand Survey Draughtsmen's Journal,* Vol. 2, No. 13, July 1955. (Discussion of some legal aspects of property rights which are of interest to the surveyor.)

LAND SURVEYING AND REGISTRATION OF TITLE TO LAND. D. A. Young. *New Zealand Surveyor,* Vol. 20, No. 4, August 1955. (Comprehensive history of the subject.)

A TECHNIQUE FOR SETTING OUT. A. J. Rusk and R. E. C. Griffiths. *Empire Survey Review,* Vol. 13, No. 98, October 1955. Detailed description of a method of making oblique radiations in connection with the design plan.)

Education

ENGINEERING EDUCATION — AN APPRAISAL. Adolph J. Ackerman. *Civil Engineering,* Vol. 25, No. 9, September 1955. (Cites need for more fact-finding on the subject.)

WORKSHOP FOR MAP LIBRARIANS. Bill M. Woods. *The Professional Geographer,* Vol. 7, No. 6, November 1955. (Describes University of Illinois special sessions for training in Cartobibliography.)

THE PARADOX OF PROFESSIONALISM IN ENGINEERING EDUCATION. John B. Wilbur. *Civil Engineering,* Vol. 25, No. 11, November 1955. (Plea for a balance between art and science in engineering education.)

Instruments

THE GEOMETER. I. A. McIntosh. *The Australian Surveyor,* Vol. 15, No. 7, September 1955. (Description of a new type of self-reducing, non-telescopic plane table alidade designed by the author.)

SUSPENSION DEVICE MAKES LEVELING AUTOMATIC. New products section. *Engineering News-Record,* Vol. 155, No. 12, September 22, 1955. (Describes new Italian-made instrument distributed by Filotecnica Salmoiraghi, Inc., 41-14 24th Street, Long Island City 1, New York.)

THE DOUBLE IMAGE TELEMETER. H. Biesheuvel. *Empire Survey Review,* Vol. 13, No. 98, October 1955. (Describes principle of the device and its employment.)

BOOKS AND PAMPHLETS

ENGINEERING USE OF AGRICULTURAL SOIL MAPS. James H. McLerran. State College of Washington, Institute of Technology, Bulletin No. 226, Pullman, Washington, 1954. 19 pp., illus.

PROGRESS REPORT ON THE CARTOGRAPHIC ACTIVITIES OF THE UNITED STATES FOR THE PERIOD FROM JULY 1, 1952 TO JUNE 30, 1954, FOR PRESENTATION TO THE VII PAN AMERICAN CONSULTATION ON CARTOGRAPHY, MEXICO CITY, MEXICO JULY 25, 1955 TO AUGUST 6, 1955. Submitted by the United States Member of the Commission on Cartography of the Pan American Institute of Geography and History. Aeronautical Chart and Information Center, St. Louis 18, Missouri, 1955. 47 pp., illus., maps.

TOWARD BETTER UNDERSTANDING AND USE OF MAPS, GLOBES, CHARTS; A PRE-SERVICE AND IN-SERVICE AID FOR TEACHERS OF GEOGRAPHY, HISTORY, AND SOCIAL STUDIES. Chicago, Denoyer-Geppert Company, 1955, 23 pp., maps.

GLOSSARY OF SELECTED GEOLOGIC TERMS: WITH SPECIAL REFERENCE TO THEIR USE IN ENGINEERING. Wm. Lee Stokes and David J. Varnes. Colorado Scientific Society, Proceedings, Vol. 16, 165 pp. Cloth $3.50, paper, $2.75.

THE PAN-AMERICAN INSTITUTE OF GEOGRAPHY AND HISTORY, ITS CREATION, DEVELOPMENT AND CURRENT PROGRAM, 1929–1954; A QUARTER CENTURY OF SERVICE TO ITS MEMBER GOVERNMENTS. Pan-American Institute of Geography and History. 115 pp., Pan-American Institute of Geography and History publication No. 180.

GEOGRAPHICAL DISCOVERY AND EXPLORATION IN THE QUEEN ELIZABETH ISLANDS. Andrew Taylor. Canada, Department of Mines and Technical Surveys, Geographical Branch, Memoir 3. Queen's Printer, Ottawa, 1955. vii and 172 pp., map. (Comprehensive history of the exploration of the Canadian Arctic with an extensive bibliography.)

ANNUAL REPORT OF THE TENNESSEE VALLEY AUTHORITY 1955. U. S. Government Printing Office, Washington, D. C., 1955. For sale by Superintendent of Documents, 65 cents. viii and 67 pp., 97 appendixes. Illus., tables.

UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR ASIA AND THE FAR EAST, 15–25 FEBRUARY, 1955, MUSSOORIE, INDIA. Vol. 1, Report of the Conference. United Nations Department of Economic and Social Affairs, New York, 1955. iv and 21 pp.

BREVE VOCABOLARIO DI TERMINI TOPOGRAFICI, ITALO-INGLESE, INGLESE-ITALIANO. (Short Dictionary of Topographic Terms, Italian-English, English-Italian.) Instituto Geografico Militare, Firenze, Italy. 1955.

SURVEY OF KENYA ADMINISTRATION REPORT, 1954. Government Printer, Nairobi, 1955. ii and 36 pp. Illus., progress diagrams.

EPHEMERIS OF THE SUN, POLARIS AND OTHER SELECTED STARS WITH COMPANION DATA AND TABLES FOR THE YEAR 1956. Prepared by Donald B. Clement, Cadastral Engineering Officer, Bureau of Land Management, U. S. Department of the Interior. GPO, 1955. For sale by Superintendent of Documents, 25 cents. 30 pp.

ANNUAL REPORT ON SURVEYS, 1955. New Zealand Department of Lands and Survey. Wellington, 1955. 17 pp.

REPORT OF PROCEEDINGS OF THE FIFTIETH ANNUAL MEETING, CORPORATION OF LAND SURVEYORS OF THE PROVINCE OF BRITISH COLUMBIA. January Thirteenth and Fourteenth, 1955, Victoria, B. C. 87 pp., illus.

—LYMAN D. LYNN
Coast and Geodetic Survey

DISTINCTIVE RECENT MAPS

Meteorological Services in the United States is the title of a 1954 map publication of the Weather Bureau, U. S. Department of Commerce. It shows locations and types of surface weather reporting stations operated by the Weather Bureau, the Civil Aeronautics Administration, the Air Force, Navy, and Coast Guard, and other agencies. Also located are international forecast centers, district forecast centers, flight advisory weather service units, Weather Bureau regional offices, airport stations and city offices. There are inset maps for some 15 or 16 metropolitan areas. The map measures 25 by 39 inches and is at the scale of 1:5,000,000.

The network of toll roads is slowly being extended in various parts of the country. The *Status of Toll Roads in the United States as of June 1, 1955* is shown on a map copyrighted in 1955 by the American Automobile Association. Roads in operation, under construction, and authorized are traced on the map. A table, keyed to numbers on the map, gives for each road the terminals, miles completed as of the date of the map, and total miles it will have when completed. The map is 17 by 23 inches.

A *Structural Geology Map of the Western United States Showing Major Intrusive and Extrusive Features* has been copyrighted (1955) by Wayne A. Fox and Jack B. Shumate. The former contributed the geologic information while the latter drafted the map. Intrusives, Extrusives, and Miscellaneous formations are shown by various symbols on this uncolored map. Structural features are also mapped and sites of commercial deposits of high and low grade uranium ore are located. The scale of the map is 1:2,500,000 and the dimensions are 47 by 35 inches.

The 1955 Christmas card of Rand McNally and Company featured a handsome colored reproduction of *A New Map of the United States of America* by J. H. Young. The 1856 map, reproduced from Mitchell's *Universal Atlas*, commemorates the centennial of the founding of Rand McNally and Company. The map, which measures 16 by 26 inches, was folded and inserted in a pocket in the greeting card.

A Literary Map of Missouri was published in April 1955 by the Missouri Association of Teachers of English. It was compiled by the Literary Map Committee under the Chairmanship of Robert J. Greef, Central Missouri State College, Warrensburg, Missouri. Orders, at one dollar per map, may be placed with Mr. Greef.

One hundred "Missouri Writers" (with date and title of an important book by each) are featured on the map. Most of the names are placed on or near the localities with which the authors or their books are identified. At the base of the map there are "A List of One Hundred Additional 'Missouri Authors', 1900–1955", and "Fifty 'Missouri Authors', 1780–1900." The map is 27 by 20 inches. No scale is given.

A Pictorial Map of the State of North Carolina was copyrighted in July 1955 by W. Creasy Overcash, Jr., 254 Hillside Ave., Charlotte 7, N. C. This uncolored map is covered with small sketches suggestive of the crops, economic activities, scenic attractions, or historic significance of specific areas. The map borders and cartouche are similarly decorated with sketches of fish, game, and natural vegetation found within the state. No scale is given on the map which measures 23 by 33 inches.

Canada's Department of Mines and Technical Surveys published recently oil and gas field maps for several of its provinces. *Southwestern Ontario, Principal Oil and Natural Gas Fields*, issued in 1953, is at the scale of 1:380,160 and measures 27 by 38 inches. *Saskatchewan Showing Oil and Gas Fields and Potential Oil and Gas Areas* is at the scale of 1:1,267,200 and measures 42 by 23 inches. It was published in 1954. *Alberta Showing Oil and Gas Fields and Oil and Gas Discoveries* was published in 1955. It is at the scale of 1:1,267,200 and measures 39 by 26 inches.

A Geological Map of the Island of Newfoundland was published in 1955 by the Geological Survey of Canada, Department of Mines and Technical Surveys. The map, which is at the scale of 1:760,320, shows formations ranging in age from Paleozoic to Carboniferous. Deposits of some thirty or more minerals are located. Large areas of the island are still unmapped and remain as blank spaces on this geological map.

A Pictorial Map of the Republic of Guatemala was published recently by the National Tourist Committee of that country. Prepared by Delfino Sánchez Latour this attractive colored map includes sketches of places of interest, scenic attractions, native customs and dress, and economic products of the country. The map measures 32½ by 31 inches. No scale is indicated.

Mapa Geologico de la Republica de Venezuela was published in 1955 by the Venezuela Ministerio de Minas e Hidrocarburos, Direccion de Geologia. The map, which is at the scale of 1:1,000,000 was prepared for presentation to the Fourth World Congress on Petroleum which met in Rome in 1955. More than twenty formations ranging from pre-Cambrian to Quaternary are represented on the map. It is printed on four sheets each of which measures 26 by 30½ inches.

Great Britain, Principal System of Farming (Generalized Distribution) was compiled by L. Dudley Stamp and Keith Buchanon for the Association of Agriculture and the National Federation of Young Farmers' Clubs. The publisher is Newman Neame Maps Ltd., 71 Blandford Street, London, W. 1, England. The map, which is at the scale of 1:900,000, differentiates seven types of farming as well as outlining urbanized areas. A booklet giving detailed descriptions of the categories shown on the map may be obtained from the Association of Agriculture, 238–240 Abbey House, 2 Victoria Street, London, S. W. 1.

Geologische Karte 1:25,000 Fürstentum Liechtenstein, presents in detail the geology of this tiny Duchy. It was prepared by Franz Allemann, Rudolf Blaser, and Henry Schaetti under the direction of Prof. Dr. Joos Cadisch. It was published in 1953 by Liechtensteinischer Schulbücher-Verlag at Vaduz. The map measurements are 39½ by 36 inches.

The J. P. Juan Co., 1351 Gral Luna, Ermita, Manila, are the publishers of a new (1955) map of the *Republic of the Philippines.* The scale is 1:1,350,000 and the size 47 by 35 inches. Provincial divisions are shown in different colors, and trails, railroads, and several classes of roads are marked. There is an enlarged inset map of Manila Bay and environs.

The Geological Survey of Japan published in 1953 a map locating the *Coal Fields of Japan* at the scale of 1:2,000,000. There are enlarged inset maps of the coal fields of Northern Kyushu, Northwestern Kyushu, Ishikari, and Joban. The outer areas of the map sheet also include graphs and tables on coal production, use, and import. The map measures 38 by 30 inches.

Australian Capital Territory and Environs is a topographical map of the region tributary to Canberra. It was published in 1952 by the National Mapping Office, Department of the Interior, Canberra. The scale is 1:126,720 and the dimensions are 37 by 24 inches.

A hypsometric relief map of New Zealand, at the scale of 1:2,000,000, was published in September 1954 by the New Zealand Land and Survey Department, Wellington. The map, which measures 34 by 24 inches, is on Lambert's Conformal Conic Projection. Besides relief, it shows spot elevations, roads, railroads, and towns and cities, classified according to population.

Expeditions Polaires Francaises published in 1955 several maps of the Adélie Land region of Antarctica based on the explorations of Expéditións Antarctiques 1948–1953 under Paul-Emile Victor. *Terre Adélie* (Carte de la Terre Adélie au 1:500,000) shows some 250 miles of the Adélie Land coast extending from Commonwealth Bay in King George V Land (143° E. long.) to 135 degrees East longitude in Wilkes Land. Routes of various earlier expeditions are traced on the map which measures approximately 23 by 27½ inches.

Sheets 1 (Rocher X) and 3 (Pointe Géologie) have been received of the *Carte de la Terre Adélie au 100,000.* The former centers on Glacier du Commandant Charcot (approx. 136° 30′ E. long.), while the latter is dominated by Glacier de l'Astrolabe. Both sheets measure approximately 27 by 27 inches.

Terre Adélie Archipel de Pointe Géologie, is an enlarged section (1:20,000) of the coastline between 139° 45′ and 140° 7′ E. longitude. It is 29 by 36½ inches.

All three maps were printed by Institut Geographique National, 136 *bis* Rue de Grenelle, Paris 7, France.

—WALTER W. RISTOW
Library of Congress

Status of Topographic Mapping

Announcement has been made by the U. S. Geological Survey of the availability of the sixth edition—January 1956—of the map "Status of Topographic Mapping."

This map, scale 1:5,000,000, shows the limits of topographic and planimetric quadrangle maps, produced by the Geological Survey and other Federal Agencies, published at various scales ranging from 1:24,000 to 1:250,000. These are also grouped according to the following classifications: modern maps, maps in need of revision, maps of limited usefulness, maps in need of resurvey, planimetric maps, and work in progress (new mapping, remapping, and revision).

The names of published maps are shown on sales indexes issued for each State. Copies of these State indexes and further information concerning current projects, the availability of maps, aerial photographs, geodetic control data, and advance map materials can be obtained from the Map Information Office, U. S. Geological Survey, Washington 25, D. C.

By means of insets, the status of mapping in Puerto Rico and Virgin Islands, Canal Zone, Hawaii, and Alaska is shown.

Books in Review

THE NORTH AMERICAN MIDWEST—A Regional Geography. Edited by John H. Garland. Published by *John Wiley & Sons, Inc.*, New York, 1955. x and 252 pages, including maps, illustrations, bibliography, and index. $8.00.

The North American Midwest is a regional geography of the heartland of the North American Continent. The midpoint of the midwest is taken as 800 miles from the nearest ocean. The nearest large city is Chicago, hence the major geographic region—the midwest—revolves about Chicago.

This book is a landmark in geographic literature because it departs radically from the usual procedure in delimiting geographic regions. Traditionally geographers have used physiographic features, climactic types, crop economies, population densities, and other criteria for delimiting geographic regions of North America, but never distance from the sea.

For purposes of characterization and interpretation, ten smaller "specific regions" are outlined within the major midwest. These subregions include the Upper Missouri Valley, Lower Missouri Valley, Ozark Upland, West Central Lowland, Upper Mississippi Valley, Upper Great Lakes, Lower Great Lakes, East Central Lowland, Upper Ohio Valley, and the Lower Ohio Valley. Regions of this size represent a refinement in geographic analysis not heretofore available in text book form. Refinement of this order is in line with those regions of Europe and other parts of the world which have been available for years.

Part I deals with the "Heart of the Continent"; Part II with those natural factors which give homogeneous character to the heartland. Such elements as weather and climate, settlement forms and patterns, agriculture, industry, trade, and transportation are all considered in a general way. Parts III and IV deal with the ten subregions for purposes of description and interpretation.

The North American Midwest is the result of the combined efforts of fourteen well-known geographers with John H. Garland, University of Illinois, as the editor. It is beautifully written by professional geographers for professional students of geography.

The outstanding contributions of the book are: (1) the challenge to our thinking concerning geographic regions in general and (2) the greater detailed descriptions and refinements in the presentation of the geographic regions of our continent.

This book in some ways could be considered a companion to A. E. Perkin's book, *The South*, written almost twenty years ago. *The North American Midwest*, however, is a regional geography and is a great improvement over its earlier counterpart.

REUEL B. FROST

Oberlin College

AGRICULTURAL ATLAS OF MISSOURI. James E. Collier. Published by the College of Agriculture, University of Missouri, Columbia, Mo. 76 pages. $1.00.

At first thought, it might seem that a review of this publication—Bulletin 645 of the Agricultural Experiment Station of the University of Missouri—is out of place in SURVEYING AND MAPPING. However, this four-color publication is a bit unique in that it contains more maps than it does pages.

The cover design includes a map showing that the State of Missouri lies about midway between the Center of Population and the Geographic Center of the United States. The 89 maps, printed in from two to four colors, display facts concerning the agriculture, forest resources, etc., of the State in a convincing manner.

The wide variety of information included in this Bulletin is shown by the following general headings under which the maps are grouped: Missouri—The State and Its People; Forests, Soils, and Climate; The Use of Land; Types, Size, and Number of Farms; Distribution of Crops; Distribution of Livestock; Agricultural Values; and Selected Agricultural Industries.

The author is Associate Professor of Geography, University of Missouri.

HOWARD S. RAPPLEYE

GEOLOGY OF SOUTHERN CALIFORNIA. Edited by Richard H. Jahns. Bulletin 170, Division of Mines, Department of Natural Resources, State of California. 1954.

This work includes contributions by more than 100 contributing authors and was prepared in cooperation with an organizing committee of The Geological Society of America. It is pub-

lished in the form of 16 separate booklets and a package of maps, comes packed in a carton measuring $3\frac{3}{4} \times 9\frac{1}{2} \times 13$ inches, and the whole affair weighs a little over nine pounds. The booklets have a page size of $8\frac{1}{2} \times 10$ inches, with the binding along the shorter dimension, and a two-column format.

The first booklet contains the general title page, a table of contents for the whole work, and the general preface. (x pp.)

The next 10 booklets are Chapters I to X, inclusive, and cover material indicated by the subtitles listed below:

I.—General Features. (53 pp.)
II.—Geology of the Natural Provinces. (160 pp.)
III.—Historical Geology. (83 pp.)
IV.—Structural Features. (59 pp.)
V.—Geomorphology. (56 pp.)
VI.—Hydrology. (28 pp.)
VII.—Mineralogy and Petrology. (75 pp.)
VIII.—Mineral Deposits and Mineral Industry. (74 pp.)
IX.—Oil and Gas. (32 pp.)
X.—Engineering Aspects of Geology. (24 pp.)

The booklets comprising Chapters II to VIII, inc., each have packets of folded maps or plates in pockets mounted inside the back covers.

The next five booklets are a series of "Geologic Guides" as follows:

No. 1.—Western Mojave Desert and Death Valley Region. (50 pp.)
No. 2.—Ventura Basin. (63 pp.)
No. 3.—Los Angeles Basin. (46 pp.)
No. 4.—Southwestern Part of the Los Angeles Basin. (14 pp.)
No. 5.—Northern Part of the Peninsular Range Province. (59 pp.)

The last item is a heavy envelope containing map sheets 1 to 34, inc.

The whole work is profusely illustrated with halftones and linecuts, and there are many small maps on the various pages, in addition to the folded maps and plates carried in the pockets and in the big envelope.

HOWARD S. RAPPLEYE

ELEMENTARY SURVEYING. Russell C. Brinker and Warren C. Taylor, *International Textbook Company*, Scranton, Pa., 1955. xiv + 550 pages. $5.50.

This third edition of "Elementary Surveying" gives one a pleasing reaction. The type is large enough to be easily read, even under other than the best lighting; the linecuts are clear, sharp, and were made from nicely executed drawings; the halftones are good; and the whole work makes a good impression.

The avowed objective of the authors has been to cover "the actual content of surveying courses now being given to students in geology, forestry, and all engineering curricula other than civil engineering." In this respect, the text lives up to specifications, and there is little doubt that it is sufficiently broad in scope to cover the courses in surveying given to students of civil engineering in some schools. It is not claimed, however, that it has sufficiently broad coverage to serve for surveying courses that *should* be given to civil engineering students in all cases.

The content and arrangement of the text can be best stated briefly by listing the chapter headings: Introduction; Theory of Measurements and Errors; Surveying Field Notes; Linear Measurements; Leveling; Angles, Bearings and Azimuths; The Compass; The Transit; Traversing; Traverse Computations; Area; Stadia; Topographic Surveys; Mapping; The Plane Table; and Adjustment of Instruments. These chapters are all included in Part I and comprise the first 265 pages.

Part II has chapters on: Determination of Meridian; Photogrammetry; Boundary Surveys; Surveys of Public Lands; Construction Surveys; Circular Curves; Parabolic Curves; Volumes; and Industrial Applications. (pages 266–386)

An interesting feature of this text is the grouping of sample forms of field notes in Appendix A. (pages 389–413) A suggested form for field notes for almost any type of plane surveying may be quickly found.

Appendix B (pages 417–531) includes the usual assortment of tables—both natural and logarithmic—and a tabulation of formulas commonly used.

There is a bibliography of 23 well-selected items and the 12-page index seems to be ample.

Obviously this is a textbook and presupposes that the student will be studying under an instructor. With this in mind, and assuming that the instructor is competent to properly qualify an occasional debatable statement, the text should serve its announced purposes well.

Coverage of the latest types of instrumental equipment is quite complete. Nearly 400 problems are arranged in groups at the ends of the chapters.

Because the page size of the book is $5\frac{1}{2}$ by $8\frac{1}{2}$ inches and the book weighs just about two pounds, it is obviously not intended as a field manual to be carried in a coat pocket.

HOWARD S. RAPPLEYE

MAP INFORMATION

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.

—EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published by the U. S. Geological Survey between September 1 and November 30, 1955. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown—except those marked with the letter (P), which are planimetric); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads, and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinate systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 20 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colo., for maps of areas west of the Mississippi River).

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* Indicates 15-minute quadrangle; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

Alabama

CHOCCOLOCCO—Calhoun

Alaska

BENDELEBEN (A–1)*—Second Judicial Division
BENDELEBEN (A–2)*—Second Judicial Division
BENDELEBEN (A–3)*—Second Judicial Division
BENDELEBEN (A–4)*—Second Judicial Division
BENDELEBEN (A–5)*—Second Judicial Division
BENDELEBEN (A–6)*—Second Judicial Division
CIRCLE (A–6)*—Fourth Judicial Division
KARLUK (B–2)*—Third Judicial Division
KODIAK (C–4)*—Third Judicial Division
KODIAK (C–5)*—Third Judicial Division
KODIAK (D–6)*—Third Judicial Division
LIVENGOOD (C–4)*—Fourth Judicial Division
TRINITY ISLANDS (C–1)*—Third Judicial Division
TRINITY ISLANDS (D–1)*—Third Judicial Division
VALDEZ (A–6)*—Third Judicial Division

Arizona

RED HILL*[1]—Yuma
TRIGO PEAKS*[1]—Yuma

Arkansas

POWHATTAN*—Lawrence
WALNUT RIDGE*—Lawrence

Arkansas-Mississippi

FARRELL*—Coahoma
MODOC*—Phillips
PARK PLACE*—Lee

Arkansas-Tennessee
EDMONSON*—Crittenden

California
ACOLITA*—Imperial
ALPAUGH—Tulare
AMBOY CRATER—San Bernardino
ASH HILL—San Bernardino
AUBURN—Placer
BACHELOR MTN.—Riverside
BALDWIN PARK—Los Angeles
BASS LAKE*—Madera
BLACKCAP MTN*—Fresno
BORON—Kern
BRENTWOOD—Contra Costa
BRISTOL LAKE NW—San Bernardino
BRISTOL LAKE SW—San Bernardino
BUFFALO CREEK—Sacramento
CAMP MEEKER—Sonoma
CARMICHAEL[1]—Sacramento
CASA DIABLO MTN.*—Mono
CHRIS FLAT—Mono
CLARKSVILLE—El Dorado
CORONA NORTH—Riverside
CORONA SOUTH—Riverside
COTATI—Sonoma
CUCAMONGA PEAK—San Bernardino
CUDDEBACK LAKE*—San Bernardino
DEADMAN LAKE NW—San Bernardino
DEADMAN LAKE SE—San Bernardino
DELANO EAST—Kern
DEVORE—San Bernardino
DRAKES BAY—Marin
EMERSON LAKE—San Bernardino
FALES HOT SPRINGS—Mono
FOLSOM—Sacramento
FONTANA[1]—San Bernardino
FURNACE CREEK*[1]—Inyo
GALWAY LAKE—San Bernardino
GLAMIS NW—Imperial
GLAMIS SE—Imperial
GOLD HILL—Placer
GRASSHOPPER VALLEY*—Lassen
GUASTI*—San Bernardino
HARRISON MTN.—San Bernardino
HIDALGO MTN.—San Bernardino
HOLLYWOOD—Los Angeles
KARLO*—Lassen
KENWOOD—Sonoma
LAMONT—Kern
LAVIC SE—San Bernardino
LEAD MOUNTAIN—San Bernardino
LEAD MOUNTAIN SW—San Bernardino
LITCHFIELD*—Lassen
LITTLE PICACHO PEAK—Imperial
LODI SOUTH—San Joaquin
LOST CANYON PEAK—Mono
LUDLOW—San Bernardino
LUDLOW SE—San Bernardino
MARION PEAK—Fresno
McFARLAND—Kern
MERIDIAN—Sutter
MILLUX[1]—Kern
MILLVILLE*—Shasta
MONO CRATERS*—Mono
MOSS LANDING—Monterey
MT. BALDY—San Bernardino
NATIONAL CITY[1]—San Diego
NORTH OF OILDALE—Kern
NOVATO—Marin
ONTARIO—San Bernardino
PASADENA—Los Angeles
PETALUMA CREEK—Sonoma
PICKEL MEADOW—Mono
PILOT HILL—El Dorado
PILOT KNOB*—San Bernardino
PIXLEY—Tulare
POINT BONITA—Marin
POINT LOMA[1]—San Diego
REDLANDS—San Bernardino
RIO BRAVO RANCH—Kern
RIVERSIDE WEST—Riverside
ROCKLIN—Placer
ROSEDALE[1]—Kern
SAGE—Riverside
SAN BERNARDINO NORTH—San Bernardino
SAN BERNARDINO SOUTH—San Bernardino
SANTA CRUZ—Santa Cruz
SANTA ROSA—Sonoma
SANTIAGO PEAK—Orange
SAN YSIDRO[1]—San Diego
SAUSALITO SCHOOL—Tulare
SEBASTOPOL—Sonoma
SHAVER LAKE*—Fresno
SHUTEYE PEAK*—Madera
SOLYO—Stanislaus
SOQUEL—Santa Cruz
STEVENS[1]—Kern
SUTTER—Sutter
TOMALES—Marin
TURTLE MOUNTAINS*—San Bernardino
VAIL LAKE—Riverside
VALLEY MOUNTAIN—San Bernardino
WATSONVILLE WEST—Santa Cruz
WENDEL*—Lassen
YUCAIPA—San Bernardino

Connecticut
COLUMBIA[1]—New London
DANBURY—Fairfield

Delaware
ELLENDALE—Sussex
GEORGETOWN—Sussex
MILLSBORO—Sussex

Florida
ARIPEKA—Pasco
ATES CREEK*[2]—Clay
BAYPORT—Hernando
BOSTWICK*[2]—Putnam
BROOKSVILLE—Hernando
BROOKSVILLE SE—Hernando
CHASSAHOWITZKA—Citrus
CHASSAHOWITZKA BAY—Hernando
CLARA—Taylor
COOKS HAMMOCK—Lafayette
COTTON PLANT—Marion
CROSS CITY EAST—Dixie
CROSS CITY SW—Dixie
CRYSTAL RIVER—Citrus
DAY—Lafayette
DAY NE—Taylor
DAY SE—Lafayette
DOWLING PARK—Suwanee
DUNNELLON—Marion
DUNNELLON SE—Marion
EHREN—Pasco
FIVAY—Pasco
HOLDER—Citrus
HOMOSASSA—Citrus
INTERLACHEN*[2]—Putnam
JENA—Dixie
MALORY SWAMP NW—Lafayette
MALLORY SWAMP SE—Dixie
MALLORY SWAMP SW—Dixie
MASARYKTOWN—Hernando
MIDDLEBURG*[2]—Clay
OZELLO—Citrus
PORT RICHEY—Pasco
PORT RICHEY NE—Pasco
RED LEVEL—Citrus
ROMEO—Marion
SALEM—Taylor
SALEM SW—Taylor
SAN ANTONIO—Pasco
SECOTAN—Taylor
STARKE*[2]—Bradford
TSALA APOPKA NE—Citrus
WEEKIWACHEE SPRINGS—Hernando
YANKEETOWN SE—Levy

Hawaii
KAHANA—Honolulu
KAHUKU—Honolulu
WAIANAE—Honolulu

Idaho
BANKS*—Valley
DEADWOOD RESERVOIR*—Valley

Illinois
AURORA SOUTH—Kane
EVANSTON[1]—Cook
HARVEY[1]—Cook
RIVER FOREST[1]—Cook

Illinois-Kentucky
CAIRO—Alexander
JOPPA—Massac
METROPOLIS—Massac
OLMSTED—Pulaski

Indiana
ZIONSVILLE—Boone

Kansas
WAMEGO SW—Riley

Kentucky
BEE SPRING—Edmonson
BELFRY—Pike
BELL FARM—McCreary
BROAD BOTTOM—Pike
BROWNSVILLE—Edmonson
BURNA—Livingston
CANEYVILLE—Grayson
CENTER—Metcalfe
CLARKSON—Grayson
COLUMBIA—Adair
CRIDER—Caldwell
CROMWELL—Ohio
CUMBERLAND CITY—Clinton
DELMER—Pulaski
DEXTER—Calloway
DRAKE—Warren
DYCUSBURG—Crittenden
EMINENCE—Henry
FALLS OF ROUGH—Grayson
FLENER—Butler
FORDSVILLE—Ohio
FRANKFORT WEST—Franklin
FRANKLINTON—Henry
GEORGETOWN—Scott
GLENSBORO—Anderson
GRESHAM—Green
HAMMONVILLE—Hart
HARDIN—Marshall
HEATH—McCracken
HORTON—Ohio
HYDEN EAST—Leslie
INEZ—Martin
JABEZ—Russell
KIRKSEY—Calloway
LA CENTER—Ballard
LANCER—Floyd
LAWRENCEBURG—Anderson
LEESBURG—Harrison
LOLA—Livingston
MAGNOLIA—Larue
MAMMOTH CAVE—Edmonson
MARION—Crittenden
MARTIN—Floyd
META—Pike
MOUNT EDEN—Spencer
OAK LEVEL—Marshall
OLNEY—Hopkins
PARADISE—Muhlenberg
PARMLEYSVILLE—Wayne
POWERSBURG—Wayne
PRINCETON EAST—Caldwell
REDBUSH—Johnson
REEDYVILLE—Butler
RHODA—Edmonson
RICHARDSON—Lawrence
RUSSELL SPRINGS—Russell
SALEM—Livingston
SAVAGE—Clinton
SCOTTSVILLE—Allen
SHADY GROVE—Crittenden
SHAWHAN—Bourbon
SITKA—Johnson
SPRING LICK—Grayson
TAYLORSVILLE—Spencer
TOMPKINSVILLE—Monroe
VARNEY—Pike
WADDY—Shelby
WOLF CREEK DAM—Russell

Kentucky-Illinois
BANDANA—Ballard
BARLOW—Ballard
CAVE IN ROCK—Hardin
GOLCONDA—Pope
PADUCAH WEST—McCracken
REPTON—Crittenden
SMITHLAND—Livingston

Kentucky-Indiana
MATTINGLY—Breckinridge

Kentucky-Missouri-Illinois
WICKLIFFE*—Ballard

Kentucky-Missouri-Tennessee
HICKMAN*—Fulton

Kentucky-Ohio
ASHLAND—Boyd
PORTSMOUTH—Scioto

Kentucky-Tennessee
ALBANY—Clinton
HAZEL—Calloway
LYNN GROVE—Calloway
PETROLEUM—Allen

Kentucky-West Virginia
KERMIT—Mingo
MATEWAN—Mingo
MILO—Martin

Louisiana
ERWINVILLE—West Baton Rouge
FORDOCHE—Pointe Coupee
FRED—East Baton Rouge
MORGAN CITY*—St. Mary
ODENBURG*—Avoyelles
OSCA BAYOU*—St. Mary
ST. BERNARD*—St. Bernard
SIKES*—Winn
THIBODAUX*—Lafourche
TULLOS*—Winn

Maine
LIMESTONE—Aroostook

Maryland
GIBSON ISLAND—Anne Arundel
GUNPOWDER*2—Harford
MOUNT AIRY*2—Carroll
NANJEMOY—Charles

Maryland-Virginia
ROCKVILLE*2—Montgomery

Massachusetts
EAST BROOKFIELD1—Worcester
GARDNER1—Worcester
PALMER1—Hampden

Massachusetts-New Hampshire
ROYALSTON1—Worcester

Michigan
DOLLAR SETTLEMENT—Chippewa
ECKERMAN—Chippewa
HULBERT—Chippewa
McNEARNEY LAKE—Chippewa
MILFORD—Oakland
PENDILLS LAKE—Chippewa
RACO—Chippewa
STRONGS—Chippewa
SULLIVAN CREEK—Chippewa

Minnesota
BAXTER—Crow Wing
PILLAGER—Cass

Mississippi-Arkansas
CLAYTON*—Tunica

Missouri
AUSTIN—Cass
BLACKBURN—Saline
BYNUMVILLE—Chariton
CLARK—Audrain
CLIFTON HILL—Randolph
CLINTON NORTH—Henry
EAST LYNNE—Cass
EVERETT—Cass
GRAND PASS—Saline
HARRISONVILLE—Cass
HIGBEE—Randolph
HOLDEN—Johnson
KINGSVILLE—Johnson
LONGWOOD—Pettis
MALTA BEND—Saline
MARCELINE—Linn
MIKE—Chariton
NELSON—Saline
PECULIAR—Cass
PLEASANT HILL—Cass
QUICK CITY—Johnson
RAYMORE—Cass
RENICK—Randolph
SHACKLEFORD—Saline
STRASBURG—Cass

Missouri-Kentucky
NEW MADRID*—New Madrid

Missouri-Kentucky-Tennessee
BAYOUVILLE*—New Madrid

Missouri-Tennessee-Kentucky
PORTAGEVILLE*—New Madrid

Montana
LAST CHANCE RANGE—Chouteau
STARVE OUT FLAT—Fergus

Nebraska
BOELUS—Howard
DANNEBORG—Howard
ELBA—Howard
FARWELL—Howard
HORACE—Greeley
NYSTED—Howard
ORD SE—Valley
ROCKVILLE—Sherman
SCOTIA—Greeley
SCOTIA NE—Greeley
STUART SE—Holt

New Hampshire
MONADNOCK*†—Cheshire

New Jersey
BLAIRSTOWN1—Warren
CALIFON1—Hunterdon
HOPEWELL1—Mercer
JAMESBURG—Middlesex
OCEAN CITY—Cape May

New Mexico
ALBUQUERQUE EAST—Bernalillo
ALBUQUERQUE WEST—Bernalillo
ESCABOSA—Bernalillo
MOUNT WASHINGTON—Bernalillo
PLACITAS—Sandoval

New York
CATO—Cayuga
HANNIBAL—Oswego
NORTHPORT—Suffolk
OSWEGO WEST—Oswego
SPRINGVILLE—Erie
WOLCOTT—Wayne

New York-Pennsylvania
ELMIRA—Chemung

New York-Vermont
TICONDEROGA†—Essex

North Carolina
FAIRFIELD NE—Hyde
SNEADS FERRY—Onslow

North Dakota
CLEVELAND—Stutsman
CLEVELAND SE—Stutsman
CLEVELAND SW—Stutsman

Oregon
SPRAY*—Wheeler

Oregon-Washington
CATHLAMET*—Wahkiakum

Pennsylvania
BLOOMSBURG*2—Columbia
BRADDOCK—Allegheny
CLINTON—Allegheny
DONORA—Washington
FAYETTE CITY—Fayette
IRWIN—Westmoreland
MIFFLINVILLE1—Columbia
MONONGAHELA—Washington
RENOVA WEST*†—Clinton
SHICKSHINNY1—Luzerne
SLICKVILLE—Westmoreland
VANDERGRIFT—Westmoreland

South Dakota
BELVIDERE NE—Jackson
BERNE—Custer
FERNEY—Brown
FOURMILE—Custer
HECLA SE—Brown
MELLETTE—Spink
OAHE SW—Stanley
PHILIP—Haakon
PHILIP JUNCTION—Haakon
PHILIP SE—Haakon
PIERRE SW—Stanley
REDFIELD NORTH—Spink
SAVO SE—Brown
SAVO SW—Brown
TETON—Stanley
WENDTE—Stanley

Tennessee
BRADFORD—Gibson
GREENFIELD—Weakley
JAMESTOWN—Fentress
NORMA—Scott
SOUTH PITTSBURG†—Marion
UNION CITY—Obion

Tennessee-Arkansas
MEMPHIS*—Shelby

Texas
DERMOTT—Scurry
HOOKS—Bowie
LAKE TEXARKANA—Cass
LEARY—Bowie
SEVENMILE BASIN—Carson

Texas-Arkansas
DOMINO—Cass
TEXARKANA—Bowie

Utah
‡CLAY HILLS 2 SE—San Juan
‡CLAY HILLS 2 SW—San Juan
‡MT. PEALE 2 NE—San Juan
‡MT. PEALE 2 NW—San Juan
‡MT. PEALE 2 SE—San Juan
‡MT. PEALE 2 SW—San Juan
‡MT. PEALE 3 NE—San Juan
‡MT. PEALE 3 NW—San Juan
‡MT. PEALE 3 SE—San Juan
‡MT. PEALE 3 SW—San Juan
‡MT. PEALE 4 NW—San Juan
‡MT. PEALE 4 SW—San Juan
‡MT. PENNELL 2 NW—Garfield
‡MT. WAAS 4 NW—Grand
‡MT. WAAS 4 SW—Grand
‡THE COCKSCOMB SW—Kane
‡TIDWELL 1 NW—Grand
‡TIDWELL 1 SW—Emery
UPHEAVAL DOME*—San Juan
WIG MTN. SW—Tooele

Utah-Colorado
‡MT. PEALE 4 NE—San Juan
‡MT. PEALE 4 SE—San Juan
‡MT. WAAS 4 NE—Grand
‡MT. WAAS 4 SE—Grand

Virginia
BUCKHORN—Nancemond

Virginia-Kentucky
CLINTWOOD—Dickenson
HARMAN—Buchanan
JENKINS EAST—Letcher

Virginia-North Carolina
CORAPEAKE—Gates

Washington
BELFAIR—Mason
MALONE*—Grays Harbor
MARBLEMOUNT*—Skagit
MT. SHUKSAN*—Whatcom
RYDERWOOD*—Cowlitz
TOUTLE*—Cowlitz

Wisconsin
MOUNTAIN*(P)—Oconto
OWEN*(P)—Clark
STRATFORD*(P)—Marathon

Wyoming
SCHNEIDER RIDGE—Carbon
SEMINOE DAM NE—Carbon
SPANISH MINE—Carbon

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. Some of these maps are published in a shaded-relief edition, as indicated in the list below. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Arizona-New Mexico
DOUGLAS†

Iowa
WATERLOO

Louisiana-Texas
ALEXANDRIA

Tennessee-Virginia-North Carolina-Kentucky
JOHNSON CITY

Special metropolitan-area and vicinity maps of major United States cities are being published and distributed by the Geological Survey. These maps are prepared from standard 7½-minute maps at the scale of 1:24,000. Vicinity maps may be purchased from the Geological Survey for 75 cents per copy. Those published between September 1 and November 30, 1955 are:

MINNEAPOLIS, ST. PAUL, AND VICINITY (46 × 56 inches)
NEW ORLEANS AND VICINITY (47 × 48 inches)
SALT LAKE CITY AND VICINITY (34 × 46 inches)

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Bldg., Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States.

37.—Coast Chart. Port Clinton, Ohio, and Colchester, Ont., to mouth of Detroit River, at 1:80,000 scale. with inset of Port Clinton, Ohio, at 1:10,000 scale. (October 1955)

376.—Monroe Harbor, Mich., at 1:20,000 scale. (November 1955)

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between September 1 and November 30, 1955. The class or purpose of the survey is indicated. Copies of plats may be secured from the Bureau Offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alaska—Fairbanks Meridian
T. 4 S., R. 3 E.—subdivision of sections

Alaska—Seward Meridian
T. 12 N., R. 2 W.—subdivision of sections
T. 2 N., R. 11 W.—original survey
T. 2 N., R. 12 W.—extension survey

Alaska—Copper River Meridian
T. 4 N., R. 2 W.—original survey

Arizona—Gila and Salt River Meridian
T. 40 N., R. 1 W.—skeleton survey
T. 40 N., R. 2 W.—skeleton survey
T. 3 N., R. 3 W.—skeleton survey
T. 40 N., R. 3 W.—skeleton survey
T. 35 N., R. 4 W.—skeleton survey
T. 36 N., R. 4 W.—skeleton survey
T. 37 N., R. 4 W.—skeleton survey
T. 38 N., R. 4 W.—skeleton survey
T. 35 N., R. 5 W.—skeleton survey
T. 37 N., R. 5 W.—skeleton survey
T. 36 N., R. 7 W.—skeleton survey
T. 37 N., R. 7 W.—skeleton survey
T. 38 N., R. 7 W.—skeleton survey
T. 3 N., R. 8 W.—skeleton survey
T. 3 S., R. 16 E.—skeleton survey
T. 4 S., R. 16 E.—skeleton survey
T. 7 S., R. 20 E.—skeleton survey
T. 2 S., R. 22 E.—skeleton survey
T. 3 S., R. 22 E.—skeleton survey
T. 3 S., R. 23 E.—skeleton survey
T. 3 S., R. 24 E.—skeleton survey
T. 4 S., R. 24 E.—skeleton survey
T. 2 S., R. 6 W.—skeleton survey
T. 5 S., R. 8 W.—skeleton survey

California—Mt. Diablo Meridian
T. 32 N., R. 5 W.—subdivision of sections
T. 27 S., R. 40 W.—(2 plats) subdivision of sections

California—Humboldt Meridian
T. 11½ N., R. 2 W.—original survey

California—San Bernardino Meridian
T. 9 N., R. 2 W.—subdivision of sections

Colorado—Sixth Principal Meridian
T. 1 N., R. 79 W.—dependent resurvey
T. 2 N., R. 79 W.—dependent resurvey
T. 27 S., R. 73 W.—dependent resurvey

Colorado—New Mexico Principal Meridian
T 40 N., R. 12 W.—dependent resurvey
T. 41 N., R. 12 E.—dependent resurvey
T. 40 N., R. 13 E.—dependent resurvey and extension survey

Florida—Tallahassee Meridian

T. 67 S., R. 25 E.—island survey
T. 66 S., R. 27 E.—island survey
T. 66 S., R. 28 E.—island survey
T. 67 S., R. 28 E.—island survey
T. 3 S., R. 16 W.—dependent resurvey and extension survey

Idaho—Boise Meridian

T. 41 N., R. 8 E.—extension survey
T. 42 N., R. 8 E.—original survey
T. 41 N., R. 9 E.—extension survey
T. 10 S., R. 21 E.—subdivision of section

Michigan—Michigan Meridian

T. 7 S., R. 8 E.—subdivision of sections

Minnesota—Fifth Principal Meridian

T. 109 N., R. 24 W.—island survey

Montana—Principal Meridian

T. 30 N., R. 11 E.—dependent resurvey
T. 31 N., R. 11 E.—dependent resurvey
T. 32 N., R. 11 E.—dependent resurvey
T. 30 N., R. 12 E.—dependent resurvey
T. 31 N., R. 12 E.—dependent resurvey
T. 32 N., R. 12 E.—dependent resurvey
T. 33 N., R. 12 E.—dependent resurvey
T. 32 N., R. 13 E.—dependent resurvey
T. 28 N., R. 39 E.—dependent resurvey

Nebraska—Sixth Principal Meridian

T. 19 N., R. 14 W.—dependent resurvey
T. 19 N., R. 15 W.—dependent resurvey
T. 21 N., R. 15 W.—dependent resurvey
T. 21 N., R. 16 W.—dependent resurvey
T. 20 N., R. 17 W.—dependent resurvey
T. 20 N., R. 18 W.—dependent resurvey
T. 29 N., R. 20 W.—dependent resurvey
T. 30 N., R. 20 W.—dependent resurvey
T. 21 N., R. 21 W.—dependent resurvey
T. 29 N., R. 21 W.—dependent resurvey
T. 30 N., R. 21 W.—dependent resurvey
T. 31 N., R. 21 W.—dependent resurvey
T. 29 N., R. 22 W.—dependent resurvey
T. 30 N., R. 22 W.—dependent resurvey
T. 31 N., R. 22 W.—dependent resurvey
T. 32 N., R. 22 W.—dependent resurvey
T. 30 N., R. 23 W.—dependent resurvey
T. 31 N., R. 23 W.—dependent resurvey
T. 30 N., R. 24 W.—dependent resurvey
T. 30 N., R. 25 W.—dependent resurvey
T. 30 N., R. 30 W.—dependent resurvey
T. 31 N., R. 30 W.—dependent resurvey
T. 31 N., R. 31 W.—dependent resurvey
T. 30 N., R. 32 W.—dependent resurvey

New Mexico—New Mexico Principal Meridian

T. 30 N., R. 4 W.—original survey
T. 6 S., R. 9 W.—dependent resurvey

North Dakota—Fifth Principal Meridian

T. 131 N., R. 59 W.—dependent resurvey
T. 144 N., R. 59 W.—dependent resurvey
T. 145 N., R. 59 W.—dependent resurvey
T. 146 N., R. 59 W.—dependent resurvey
T. 145 N., R. 60 W.—dependent resurvey
T. 146 N., R. 60 W.—dependent resurvey
T. 151 N., R. 62 W.—dependent resurvey
T. 150 N., R. 63 W.—dependent resurvey
T. 151 N., R. 63 W.—dependent resurvey
T. 151 N., R. 67 W.—dependent resurvey
T. 148 N., R. 70 W.—dependent resurvey
T. 149 N., R. 72 W.—dependent resurvey
T. 148 N., R. 73 W.—dependent resurvey
T. 149 N., R. 73 W.—dependent resurvey
T. 148 N., R. 74 W.—dependent resurvey
T. 149 N., R. 74 W.—dependent resurvey
T. 148 N., R. 75 W.—dependent resurvey
T. 149 N., R. 75 W.—dependent resurvey
T. 147 N., R. 76 W.—dependent resurvey
T. 148 N., R. 76 W.—dependent resurvey
T. 149 N., R. 76 W.—dependent resurvey
T. 150 N., R. 76 W.—dependent resurvey
T. 145 N., R. 77 W.—dependent resurvey
T. 146 N., R. 77 W.—dependent resurvey
T. 147 N., R. 77 W.—dependent resurvey
T. 158 N., R. 77 W.—dependent resurvey
T. 144 N., R. 78 W.—dependent resurvey
T. 158 N., R. 78 W.—dependent resurvey
T. 161 N., R. 78 W.—dependent resurvey
T. 138 N., R. 80 W.—dependent resurvey
T. 145 N., R. 79 W.—dependent resurvey
T. 145 N., R. 80 W.—dependent resurvey
T. 146 N., R. 80 W.—dependent resurvey
T. 147 N., R. 80 W.—dependent resurvey
T. 162 N., R. 80 W.—dependent resurvey
T. 163 N., R. 80 W.—dependent resurvey
T. 138 N., R. 81 W.—dependent resurvey
T. 139 N., R. 81 W.—dependent resurvey
T. 147 N., R. 81 W.—dependent resurvey
T. 138 N., R. 82 W.—dependent resurvey
T. 139 N., R. 82 W.—dependent resurvey
T. 147 N., R. 82 W.—dependent resurvey
T. 138 N., R. 83 W.—dependent resurvey
T. 143 N., R. 83 W.—dependent resurvey
T. 144 N., R. 83 W.—dependent resurvey
T. 143 N., R. 84 W.—dependent resurvey
T. 144 N., R. 84 W.—dependent resurvey
T. 136 N., R. 89 W.—dependent resurvey
T. 136 N., R. 90 W.—dependent resurvey

South Dakota—Fifth Principal Meridian

T. 126 N., R. 60 W.—dependent resurvey
T. 113 N., R. 61 W.—dependent resurvey
T. 126 N., R. 61 W.—dependent resurvey
T. 126 N., R. 62 W.—dependent resurvey
T. 111 N., R. 64 W.—dependent resurvey
T. 112 N., R. 64 W.—dependent resurvey
T. 113 N., R. 64 W.—dependent resurvey
T. 115 N., R. 64 W.—dependent resurvey
T. 109 N., R. 65 W.—dependent resurvey
T. 110 N., R. 65 W.—dependent resurvey
T. 111 N., R. 65 W.—dependent resurvey
T. 112 N., R. 65 W.—dependent resurvey
T. 114 N., R. 65 W.—dependent resurvey
T. 115 N., R. 65 W.—dependent resurvey
T. 110 N., R. 66 W.—dependent resurvey
T. 111 N., R. 66 W.—dependent resurvey
T. 115 N., R. 66 W.—dependent resurvey
T. 111 N., R. 67 W.—dependent resurvey
T. 112 N., R. 67 W.—dependent resurvey
T. 115 N., R. 67 W.—dependent resurvey
T. 111 N., R. 68 W.—dependent resurvey
T. 112 N., R. 68 W.—dependent resurvey
T. 115 N., R. 68 W.—dependent resurvey

South Dakota—Black Hills Meridian

T. 10 N., R. 1 E.—dependent resurvey
T. 11 N., R. 1 E.—dependent resurvey
T. 12 N., R. 1 E.—dependent resurvey
T. 11 N., R. 2 E.—dependent resurvey
T. 12 N., R. 2 E.—dependent resurvey
T. 13 N., R. 2 E.—dependent resurvey

Utah—Salt Lake Meridian

T. 30 S., R. 7 E.—extension survey
T. 30 S., R. 8 E.—extension survey

Wyoming—Sixth Principal Meridian

T. 54 N., R. 100 W.—subdivision of sections
T. 53 N., R. 101 W.—subdivision of sections
T. 54 N., R. 101 W.—subdivision of sections
T. 55 N., R. 101 W.—(2 plats) subdivision of sections

Wyoming—Wind River Meridian

T. 3 N., R. 1 W.—subdivision of sections

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to a free and temperate discussion of all matters pertaining to the interests of the CONGRESS. It is the purpose of this Department to encourage comments on published material or the presentation of new ideas in an informal way.
—EDITOR

W. S. DIX*—The following paragraph is quoted from a review of the "Proceedings of the Third National Surveying-Teachers Conference, August 3 to 8, 1952," by P.N.R. in the *Empire Survey Review*, October 1955, No. 98, Vol. XIII, pages 188–189, inc.

One whole article entitled "Surveying Field Tests" is devoted almost entirely to a list of what are considered suitable field tests for students. These tests are obviously taken very seriously at the university concerned, but the British reader will wonder whether such tasks as "stake-driving," "tying the plumb-bob string," "pacing," or "cutting a cross-cut" are really worthy of inclusion in any university course; certainly he will wonder whether they are suitable for inclusion in what is virtually a carefully assessed competition, the marks for which carry through and directly determine the student's final grade. Emphasis on such things must surely very largely kill a man's interest in surveying, and make him think of the subject as a whole succession of tedious little practical jobs.

I wish to stress the importance of the *little things* that can directly affect, for better or for worse, the quality or accuracy of survey work. Who trains the officers to train the sergeants to train the men? Certainly a surgeon, no matter how thoroughly steeped in theory, could not be a good surgeon if he was not trained to sharpen his scalpels, cut and sew, wash his hands, or properly sterilize his equipment. A structural engineer who could not make a weld, form a rivet, or properly tighten a bolt would be in a poor position to inspect for proper work; otherwise he must rely on his foreman's knowledge and informal training.

The greater the improvement in instrumental equipment; the greater the refinements in optics, graduation of circles, and graduation of leveling rods; the greater the emphasis on precision—the greater becomes the necessity for paying strict attention to the "whole succession of tedious little practical jobs."

In the days of the compass and chain, or even in the era of the minute-reading transit and the unstandardized tape, an off-line plumb, a sloppy mark, or a slightly unstable peg caused little or no concern. However, now that we have instruments reading to seconds of arc and to tenths of millimeters on leveling rods, the *little things* become increasingly important. If the student is not trained to do the *little things* properly while he is a student, he must eventually learn on the job and at the risk of turning out quite inferior work until he does learn at the expense of much grief.

Can you imagine a sculptor relying on his laborers and helpers to put the finishing touches on his masterpiece?

The surveyor who knows how to do properly the *little things* that can make or break a survey is in a good position to teach and supervise his "sergeants" and "men" to do good work.

* Executive Secretary, ACSM.

CARTOGRAPHY IN THE COMIC STRIPS

WALTER S. DIX*—Your December 18, 1955, release of your comic strip "King Aroo," featuring cartographic treatment of map borderlines and King Aroo's concern with how difficult it was to find his tiny kingdom of Myopia on the World Map—and the observant sagaciousness of his advisor re new border-line treatment—obviously caught the eye of a great many of ACSM members who are professionally engaged in map-making. In fact it has caught the eye of map-design experts of the great mapping agencies, and it has been called to the attention of the Committee on Map Symbols.

Aside from the facetious aspects, which we thoroughly enjoyed, we professionals also ap-

* Letter to Mr. Jack Kent, c/o McClure Newspaper Syndicate, 75 West Street, New York City, N. Y.

preciate a public-relations angle toward public interest—and therefore recognition—in, and of, our very important but not too well known about field of endeavor.

It is especially gratifying to see the highest official of his country seriously concerned about the maps of his country—and like the gibes of the court Jesters of old, many a serious point has been made under the veil of joking. The head of any country cannot be too concerned about his maps. Good maps are basic and fundamental to intelligence on all matters. It is indeed a grave error in judgment when any administrative officials say they are much too busy with affairs of state to be concerned with matters of maps or surveys.

Another point of appreciation from us is the observation that it is a well-established mark of recognition when anything is lampooned. Thank you for letting us see ourselves in the "funny papers" and feel free to put surveyors and mappers in the "strip" often.

Editory Yell

Now this is SURVEYING AND MAPPING, its pages form our well-known Journal
And most of the papers are not the right length, but the editor's hope is eternal,
And "Someday," he thinks, "I will find one that fits without need for a filler."
But fillers are scarce as hen's teeth, and we can't use the jokes of Joe Miller.
Your editor worketh for nothing and boardeth himself out of pocket.
He's trying his best to produce, but his need for good fillers does rocket,
So please, one and all, keep your eye on the ball for its fillers we're needing
And send some along for its fillers, more fillers, for which we are pleading.
Now, "What is a filler?" you ask. It is just a short item that's worthy
To fill in a hole at the end of a page. We need *help* so bestir thee.

—EDITOR

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News of Related Organizations

Massachusetts Association Holds First Annual Meeting

For what is believed to be the first time that a land-surveyors' society has ever convened as such in an annual meeting in New England, the recently-formed Massachusetts Association of Land Surveyors and Civil Engineers held its first annual meeting on December 2 and 3, 1955, at the Hotel Bradford, Boston, Mass. So successful was this first attempt, under the able Co-chairmanship of Harry R. Feldman and George McKenna, that plans are already being made for the 1956 meeting which will be held at the same place and about the same time of year.

One of the highlights of the two-day program, which was opened with an official greeting by Gordon E. Ainsworth, President of the Association, was a panel discussion and forum on "Legal Aspects of Land Surveying in the Commonwealth of Massachusetts." Llewellyn T. Schofield, Secretary of the Association and former deputy engineer for the Massachusetts Land Court, served as moderator. The panel members were Charles Anderson, engineer for the Massachusetts Land Court; Walter Rowley and Henry Robinson, registered land surveyors; and Henry Meyer, attorney.

The Hon. C. C. Lindsay, Past President of the Quebec Land Surveyors Association, spoke, with all the authority and ability for which he is so well known, on "The Legal Status of Land Surveyors in the Province of Quebec." Those present learned that, in comparison with practice in the United States, the responsibilities of Quebec surveyors extend further into the legal field.

Another important paper was presented by Elmer C. Houdlette, location and surveys engineer, Massachusetts Department of Public Works. He spoke on "The Plane Coordinate System in Massachusetts and its Relation to Property Surveys," emphasizing the value of the system in providing a means of accurately relocating points. Perhaps the most enjoyable of the sessions was an open-forum discussion of surveyors' problems led by John T. Casey, registered land surveyor and civil engineer of Ware, Mass. Among the points discussed were (1) What use is being made of U. S. Geological Survey topographic maps and control? (2) Where in Massachusetts can descriptions and coordinates of all control stations be obtained? (Mr. Houdlette stated that his office will soon have complete data on control established by all agencies.) (3) What are surveyors' responsibilities in establishing street lines?

All five chapters of the Association—the Cape Cod, Eastern Massachusetts, Central Massachusetts, Connecticut Valley, and Berkshire Chapters—were well represented and actively participated in the program. Exhibits, by manufacturers and dealers, of surveying and mapping equipment and displays by Federal and State surveying and mapping organizations were on view throughout the meeting.

It is tentatively planned that the next annual meeting will be a regional affair, with invitations extended to other New England societies, particularly those in Maine, New Hampshire, and Vermont.

—Gordon E. Ainsworth
President, MALSCE

Wisconsin Society of Land Surveyors

The Annual Meeting of the Wisconsin Society of Land Surveyors was held on the evening of December 1, 1955, at the University of Wisconsin, Madison. As in the past, the meeting was held in conjunction with the Land Surveyors Institute conducted by the Extension Division of the University of Wisconsin in cooperation with the Wisconsin Society of Land Surveyors.

Forty-three members and guests were present when Robert D. Hall, Society President, called the meeting to order.

Robert J. Poss, Chairman of the Legislative Committee, expressed his gratitude to the en-

tire group for their splendid support during the legislative drive which culminated in the passage of the Wisconsin Surveyor Registration Act —the big news in Wisconsin surveying in 1954. Darwin W. Hintz, Chairman of a special committee, reported that the passage of this act will necessitate certain changes in the WSLS constitution and by-laws and presented a signed petition to effect the amendment. William E. Raffin, Chairman of the Fees, Salaries, Ethics, and Practice Committee, suggested that, in view of the passage of the act, the committee should undertake the task of establishing a basis for computing fees for land surveying in Wisconsin.

The balloting, which followed the presentation of a slate of candidates for 1956 officers by the Nominating Committee, resulted in the election of the following:

Robert H. Lange, *President*
Franklin P. Gould, *Vice President*
Robert L. Smith, *Secretary-Treasurer*
Ray W. Hurlburt, *Director*

Holdover directors are as follows:

Otho O. Bergman	Karl W. Fuge
Robert D. Hall	James A. Eide

Robert L. Smith, Secretary-Treasurer, reported a net gain of 32 members during the year, raising the total membership to 158. He reported that the finances of the Society are in good condition, despite large expenditures during the year in the interest of passage of the registration act.

The Seventh Surveyors Institute, held November 30 and December 1 and 2, had one of the largest enrollments to date. Among the wide range of subjects covered were the following: the new platting law; aerial surveys; use of aerial photographs by surveyors; the expert witness and his evidence; new surveying legislation; modern surveying instruments; and a case study of surveying problems. Leonard F. Hillis of the Extension Division served as Coordinator of the Institute; E. C. Wagner and H. A. Kallsen of the College of Engineering served on the staff. All are members of WSLS. James H. Lange served as Chairman of the Program Committee of WSLS in advising on the selection of the program for the Institute.

—ROBERT L. SMITH
Secretary-Treasurer

New Jersey Land Surveyors Hold Sixteenth Annual Conference

The largest conference* of land surveyors at the State level ever held occurred on January 21, 1956, when the Land Surveyors Division of the New Jersey Society of Professional Engineers met at the Rutgers University Commons, New Brunswick, N. J. The registered attendance of 302 greatly exceeded the previous record of 229 established a year ago in spite of some adverse weather and hazardous driving conditions occurring in certain parts of the State. The above figure does not include numerous students and others regularly using the Commons that viewed the many interesting exhibits. A substantial factor in the large attendance was a special letter of invitation sent to all New Jersey members of ACSM.

The number of exhibitors at 32 exactly equalled the record-breaking number at the Conference a year ago. However, floor space necessary increased to 3,100 square feet, requiring an additional area of the main dining room. The exhibitors included a substantial number of sustaining members of ACSM or their dealers, or in some instances both. Among the new items probably not heretofore exhibited at a surveying conference were a large assortment of fine oak stakes, uniquely packed for convenient handling, a by-product of outdoor oak furniture manufacture by the Sullivan County Wood Products Co. of Monticello, N. Y. Another exhibit that attracted special attention was a display of jeeps with hole-drilling and other attachments for surveyors and engineers, presented by George Downes of Matawan, N. J., for Willys Motors Inc. In view of long existing New Jersey laws requiring monuments on subdivisions and a very recent law requiring extensive "percolation tests," before new subdivisions may be approved and filed, these labor-saving devices were of special interest.

Among the exhibits was a large table filled with examination copies of ACSM's journal, SURVEYING AND MAPPING, and an assortment of reprints from the journal. A similar table

* In a news account of our 15th Annual Conference in the January–March 1955 issue of SURVEYING AND MAPPING, page 95, that Conference was described as "one of the largest" and ACSM members were invited to report to NJSPE any larger. Since no reports have been received during the year this is believed to be an accurate statement.

was arranged for the National Society of Professional Engineers and the New Jersey Society of Professional Engineers.

After a breakfast get-together, Robert McEldowney Jr., Chairman of the Division, called the meeting to order. An appropriate invocation was given by Prof. Paul P. Rice, Secretary of the Division. This was followed by words of welcome from Dr. Elmer C. Easton, Dean of the College of Engineering.

The Conference Theme was "Land Surveying—Viewpoints of other Professions." This theme was selected by the directors of the Division because at this time revisions are in prospect to clarify and strengthen New Jersey laws regulating the licensing of professional engineers and land surveyors, subdivision, planning and map filing. In addition, new and additional legislation is expected.

During the morning session five speakers, each representing different professions, presented their viewpoints. The speakers were Myron X. Feld, Vice President-elect of the Municipal Engineers Association; Joseph L. Rusch, realtor and Executive Vice President of Alexander Summer Company; Fred G. Stickel III, Past President of the New Jersey Municipal Attorneys Association; Norman C. Wittwer, Supervising Engineer, Division of Water Policy and Supply, N. J. Dept. of Conservation and Economic Development; and Howard F. Koons, President of Howard F. Koons Associates representing the New Jersey Federation of Planning Boards. Michael A. Canger, Jr., Co-Chairman of the Land Surveyors Division was the sixth speaker on the program to explain and answer in the short remaining time some of the questions and problems presented by the previous speakers.

An unusually long luncheon period of two hours was provided so that those attending had an opportunity to inspect the large number of exhibits, as well as enjoy a cafeteria-style luncheon in the University Commons.

The afternoon session was presided over by Michael A. Canger, Jr., Co-Chairman of the Land Surveyors Division. This session was devoted largely to business; however, some of the interesting discussions of the morning were continued. Merton S. Adams, President of the New Jersey Society of Professional Engineers, expressed the greetings of the Society and made various recommendations for professional advancement. Secretary Paul P. Rice expressed the good wishes of President Lester C. Higbee of ACSM who had expected to be present. Plan and train schedules finally did not permit him to return in time from Indiana where he attended a seven-State organization meeting of surveyors the preceding day. At the close of the meeting, 65 door prizes having retail value of over $700, consisting largely of various items of surveying equipment, were awarded.

PAUL P. RICE, *Secretary*
Land Surveyors Division, NJSPE

Indiana Society of Professional Land Surveyors

The fourth annual Indiana Land Surveyors' Conference, sponsored jointly by the Purdue University School of Civil Engineering, the Division of Adult Education, and the Indiana Society of Professional Land Surveyors, was held on January 20 and 21 on the Purdue campus.

The program for the conference, worked out by Prof. L. H. Kemmer and Prof. K. S. Curtis, was based on topics suggested in a popularity poll taken two years ago. Among the interesting papers presented were "A Young Man Looks at the Land Surveying Profession," two papers and a panel discussion all devoted to the legal aspects of land surveying, and papers on the care and adjustment of instruments and on the use of the subtense bar. Other subjects covered include technical standards for property surveys and the role of the surveyor in city planning.

On the evening of the first day of the conference, a dinner meeting was held at which the guest speaker, Lester C. Higbee, President of the American Congress on Surveying and Mapping, gave a talk on "The Future of Surveying and Mapping." Following Mr. Higbee's talk, an organizational meeting was held at which steps were taken toward formation of a Great Lakes Section of ACSM.

A highlight of the business meeting, which concluded the second day of the conference, was the presentation to Arthur D. Kidder of a special honorary president-emeritus status in the Society in recognition of his many years with the U. S. General Land Office.

The new officers of the society, announced at the business meeting, are:

Arthur Buerkle, *President*
George Crowder, *Vice President*
Richard Long, *Secretary-Treasurer*
Kenneth S. Curtis, *Executive Secretary*

The social part of the program was nicely rounded out with a musical convocation, "The Irish Festival Singers," on the first evening, and a basketball game between Ohio State and Purdue on the second evening.

—KENNETH S. CURTIS
Executive Secretary, ISPLS

Nova Scotia Surveyors Hold Fifth Annual Meeting

A copy of the December 1955 issue of *The Nova Scotian Surveyor,* quarterly journal of the Association of Provincial Land Surveyors of Nova Scotia Incorporated, was recently sent to the Publications Committee of ACSM by R. E. Millard, Managing Editor of that publication. From it we learn that the 189-member Association held its Fifth Annual Meeting on November 29 and 30, 1955, at the Nova Scotia Technical College, Halifax, with 42 members, 3 visiting delegates, and several guests in attendance.

J. E. R. Marsh, President of the Association, opened the meeting with a welcoming address and introduced the visiting delegates from the Association of New Brunswick Land Surveyors: W. L. Roberts, *President;* H. P. Lingley, *Vice President;* and H. E. Tait, *Secretary-Treasurer.*

One of the major topics of discussion at the business sessions of the meeting was reciprocity between the New Brunswick and the Nova Scotia Associations and Provinces on the matter of issuing of licenses to practice land surveying to surveyors who already hold a license in one Province but wish to practice in the other. After much discussion, committees were set up by each association to study the problem.

Another important subject of discussion was the matter of minimum fees for surveyors. Some doubt was expressed that the Association had the power to establish and enforce minimum rates. The matter was referred to a committee consisting of members of the present Executive.

Many interesting papers were presented at the technical sessions. The titles of some of these are: "Construction of Base and Type Maps for Forest Inventory," "The Legal Aspects of Surveying," "Surveying and Survey Problems in Cape Breton," and "Nova Scotia Power Commission Surveys."

Officers of the Association for 1956, elected at the meeting, are as follows:

R. E. Millard, *President*
Freeman Tupper, *Vice President*
R. M. Schofield, *Secretary-Treasurer*

New "Upside-Down" Map

To the average motorist who is traveling southward, the use of standard highway maps presents some difficulties. If he keeps the map oriented so that names, route numbers, and descriptive notes are readily readable, he must remember that an apparent right turn is actually a left turn and vice versa. If he reverses his map so that the turns appear in their proper relation to the terrain, most of the lettering on the map must be read from an upside-down position.

Esso Standard Oil Company has taken pity on the thousands of southward-bound motorists traveling from New York to Florida by bringing out a map on which New York City appears in the lower left corner and the Florida peninsula extends upward and to the left at the top of the map. This makes for easy map reading on the way south, but when the motorist comes back north on his way home he will do well to provide himself with a standard highway map.

The "New York to Florida 'Upside-Down' Map" is available from EssoTouring Service, 261 Constitution Avenue, Washington 1, D.C., or from Esso service stations along the main New York to Florida routes.

CONGRESS NEWS

Cartography Division Annual Meeting

The Technical Division on Cartography held its annual meeting in the Interior Department Auditorium in Washington, D.C., on December 8, 1955. Chairman Joseph P. Dunich presided at this evening meeting.

Walter S. Dix, Executive Secretary of ACSM, gave a brief statement concerning the aims and purposes of ACSM.

D. K. Martin, Deputy Director, Air Navigation Development Board, spoke on the subject "TACAN and Navigational Charts." His talk was illustrated, not only with a number of slides but by means of motion pictures as well.

Norman Moore, Civil Engineer, Division of Project Development, Bureau of Reclamation, spoke on "A Reconnaissance Survey of Reclamation."

These talks were followed by a showing, through the courtesy of the Department of the Army, of a motion picture film, "Exploitation of Aerial Photographs" showing how aerial photography is used under combat conditions.

The final item on the program was the drawing for two door prizes furnished by Rand McNally and Company.

Texas Section

The big news in Texas for 1955 was the passage of House Bill No. 142 creating a State Board of Registration for Public Surveyors. Governor Allen Shivers signed the act on April 29, 1955. On June 13, 1955, the new Board met in Austin, elected temporary officers, and made committee assignments. The Board appointed by the governor is as follows:

Clifford Cool, Midland
Fred Williamson, Temple
J. S. Boyles, Houston
Staley Mims, Crockett
L. V. Norris, Beaumont
Arch Clark, Dallas

The Board elected Mr. Williamson as its Temporary Chairman; Mr. Clark, Temporary Vice-Chairman; and Mr. Norris, Temporary Secretary.

September 6, 1955, was the date the Board became legally operative. Since that date applications have been accepted for registration under three separate sections.

When Texas was admitted to the Union it retained title to its lands, and matters relating to such lands are handled by the General Land Office of Texas. Survey notes, reports by surveyors, correspondence, maps and sketches are submitted to and retained by that office. Copies of Patents (land) are retained in the General Land Office files. Since the surveyors of Texas must have copies of this information before making surveys of lands in Texas, the business of the General Land Office of Texas is of paramount interest to all surveyors in Texas.

J. Earl Rudder, Commissioner of the General Land Office of Texas (an elective office), was the principal speaker for the Seventeenth Meeting of the Texas Section, held in July 29, 1955. Approximately 180 members and guests (a record for the Texas Section) attended the meeting. G. W. Herzog, Chairman of the Program Committee, presided. Refreshments were served from 5:30 to 6:30 p.m., followed by a barbecue, a film entitled "A New Look for Oil," and Land Commissioner Rudder's address entitled "Land Office—Its Records."

The Commissioner told the members of the Texas Section and their guests: "You, gentlemen, are the eyes and ears of the Land Office. It is only through your eyes that we, in Austin, can learn the facts about Texas land and its land titles upon which we must base the vital decisions which make up our General Land Office business." He also discussed the methods Texas has used in disposing of approximately 169,000,000 acres of its lands.

—Hodge E. Mason
Editor, Texas Section

The Eighteenth Meeting of the Texas Section, held October 27, 1955, was reported in Surveying and Mapping, October–December 1955, Vol. XV, No. 4, page 501.

—Editor

The Texas Section held its 1955 Annual Meeting on the evening of December 8 at the Armadillo Club, Houston. More than 80 members and guests attended.

The social part of the program, which preceded the technical and business sessions, started off with a cocktail hour which gave an opportunity for the meeting of old acquaintances and the making of new ones. This was followed with an excellent turkey dinner.

W. L. Egy, Executive Vice President of the Brunson Instrument Company of Kansas City, Mo., was the guest speaker. Mr. Egy spoke on the evolution taking place in telescopes and optical instruments. He expressed the thought that the craftsmen in the instruments plants could benefit from advice on further improvements from those who use the instruments.

Section Chairman R. L. Sargent, in his report to the members, stated that 1955 was an important and eventful year for surveyors, both on a national as well as a local level. He cited the successful joint meeting in Washington, D. C., of ACSM and the American Society of Photogrammetry, on the national level, and locally, the passing of the Texas Public Surveyors License Law. In connection with the latter, Mr. Sargent emphasized that the mere hanging of a surveyor's license on the wall and the possession of a surveyor's seal did very little to improve one's surveys. He urged all surveyors to strive for more accuracy in their work, more knowledge through constant reading and study, more ethical professional behavior, and a lot more hard work, in an effort to merit professional recognition and respect.

The Section officers for 1956 and the directors, announced by the tellers committee, are as follows:

Officers

J. A. Tomlinson, *Chairman*
Wm. F. Sullivan, *1st Vice Chairman*
Wm. C. Walsh, *2nd Vice Chairman*
Glenn E. Musselman, *3rd Vice Chairman*
Ivan W. Perry, *Secretary*
Tom Dillon, *Treasurer*

Directors 1956

L. P. Carr R. L. Sargent

Directors 1956–1957

L. E. Cornitius C. J. Montgomery, Jr.

Chairman Sargent announced that an advanced course in surveying will be available in the fall of 1956 at the University of Houston.

—Cecil J. Foster
Secretary

Louisiana Section

The New Orleans Engineers' Club rooms in the De Soto Hotel, New Orleans, were the scene of the quarterly meeting of the Louisiana Section, ACSM, on December 12, 1955.

After a social hour beginning at 7 p.m., Chairman Jack Toler called the 93 members and guests to order and announced that the cocktail party which had been scheduled for December 15 had been cancelled because of the large number of members who had indicated inability to attend. Instead, a dinner meeting will be held at the next quarterly meeting in April 1956.

N. H. "Available" Jones and Bob Dodge of Lighthouse, Inc., and Buoys, Inc., respectively, gave a short talk on buoys used in making offshore locations. The talk was supplemented with a movie showing the application of buoys by a major oil company operating off the Texas Coast.

An interesting paper entitled "Surveying in New Orleans," was presented by Mr. Gandolfo, a well known New Orleans surveyor. Of particular interest were the problems experienced by Mr. Gandolfo around New Orleans.

A general-interest film entitled "This is Louisiana," which was the final item on the program, gave those assembled an opportunity to become better acquainted with their State.

—G. E. Mott
Secretary

Northern California Section

President Lester C. Higbee was the guest speaker at the meeting of the Northern California Section, held in San Francisco on September 16, 1955.

He gave a very informative talk to an appreciative audience. He spoke on the annual meeting in Washington and stated that Washington was an ideal place to hold these meetings because a great percentage of the federal agencies working with and for maps were located there, with all their equipment available for inspection.

Mr. Higbee mentioned the various resolutions passed at the annual meeting, and he gave high praise to the editors of SURVEYING AND MAPPING for their efforts in enlightening the members not able to attend the conventions by interesting accounts of the meetings published in the journal.

As a representative of the Congress, Mr. Higbee has traveled extensively, and he related some of his experiences on these trips.

He stated that some of the fields in which all may help in advancing the profession of surveying are: education of new men in surveying and mapping, advancement of professional ethics, dissemination of material, education of the public to the recognition of the surveying profession, legal surveys by licensed men, and good physical monumentation of boundaries established.

Mr. Higbee expressed his belief that good standards should be set up locally and that these should be tempered by national standards. A fine approach to this is through the annual and mid-year meetings of congresses and societies for the advancement of the profession.

The Northern California Section meeting of October 21, 1955, was held at Santa Rosa, Calif. The meeting was preceded by a dinner at the Hotel Occidental. After the dinner, Paul Dowling, program chairman for the evening, discussed the activities of the Congress in that area.

Charles A. Wooldridge, Chairman of the Northern California Section, spoke on the various activities of the ACSM. Roland Moore, chairman elect, discussed tentative programs for the coming year.

Professor Frank Moffitt, University of California, gave an interesting talk, illustrated with blackboard sketches, on the theory of the Lambert Projection and the California Coordinate System. C. J. Aggeley, City College of San Francisco, discussed applications of the California Coordinate System in various engineering developments. These talks were followed by general discussion and the two speakers answered questions from the floor regarding the technical phases of various problems.

—HARLEY A. WATERFALL
Secretary

Continuing its program of having frequent meetings throughout the year in various parts of the Northern California area, the Northern California Section held three meetings during the last two months of 1955, one at Sacramento, one at San Jose, and one at San Francisco.

The Sacramento meeting was held on November 4 in the Public Works Building. V. S. Seward was in charge of the program which included, during the afternoon, a series of nonscheduled tours through the United States Geological Survey plant in North Sacramento. Visitors were given an opportunity to view any or all of the various Topographic Division operations, including photogrammetry, field surveys, photo services, cartography, and geodesy, as well as the activities of the Water Resources and the Conservation Divisions.

At the evening meeting which followed, Lt. Col. W. W. Walters, Commanding Officer of the 660th Battalion, 30th Engineers, U. S. Army, gave a talk, illustrated with slides and motion pictures, on "Task Force Alaska." The title of his talk is the name given to the 1955 operations of the Corps of Engineers in the mapping of Alaska.

The second of the three meetings was held on November 18 at San Jose State College in San Jose. The meeting subject was "Record of Survey Maps." Samuel M. Black, Monterey County Surveyor, covered the subject from the standpoint of the public official charged with the duty of checking record of survey maps before accepting for filing, and C. A. Wooldridge, Jr., a surveyor in private practice at Carmel, commented on the requirements of the Record Survey Law as they affect the licensed land surveyors. An interesting discussion from the floor was touched off by the fact that the application of the law appears to be different in each of the several counties represented.

The San Francisco meeting, which was held at City College of San Francisco on the evening of December 2, had as its principal attraction a

talk on the "Missions of the Corps of Engineers" by Col. J. A. Graf, San Francisco District Engineer, Corps of Engineers. Col. Graf's talk was not only interesting but, at points, surprising, for in its 175 years of existence the Corps has been delegated a vast and sometimes seemingly unrelated assortment of duties.

The officers and directors of the Section for the 1956 fiscal year, beginning Nov. 1, 1955, and ending Oct. 31, 1956, are as follows:

Roland H. Moore, *Chairman*
Harley A. Waterfall, *Vice Chairman*
Tracy L. Atherton, *Secretary-Treasurer*
Charles O. Greenwood, Jr., *Editor*
C. A. Wooldridge, Jr., *Past Chairman*
F. H. Moffitt, *Director, 1955–56*
G. C. Bestor, *Director, 1955–56*
P. J. Dowling, *Director, 1956–57*
W. A. White, *Director, 1956–57*

—Charles O. Greenwood, Jr.
Section Editor

Southern California Section

Nearly one hundred members of the Southern California Section, ACSM, and their wives and friends attended the Annual Banquet and Ladies Night which was held in the Roger Young Auditorium in Los Angeles on December 2, 1955.

The evening began with a cocktail hour during which old friends were greeted and new friends made. This was followed by a delicious prime rib or lobster Newberg dinner.

Following the dinner, the election of officers for the year 1956 took place. The results were as follows:

Officers

Don P. Jones, *Chairman*
Selwyn Douglas, *Vice Chairman*
George L. Baker, *Secretary*
Albert Cocking, *Treasurer*
Harvey E. Rookus, *Editor*

Directors

John E. Asher — William C. Meek
Robert B. Irwin — Roy M. Sylar
Henry L. Thompson

The highlight of the evening was the presentation of Student Awards to outstanding students in surveying and mapping. There were six awards, the six students representing five colleges in the Los Angeles area, each award being a year's membership in both the Southern California Section and the national organization of ACSM. Each of the students was introduced by his instructor and then given his award. The students so honored were:

Josue Alvidrez, Los Angeles City College
Gary Greytak, Long Beach City College
Dennis P. Keene, Los Angeles City College
John W. Murphy, Glendale College
Norman C. Wingerd, Surveying Institute, Pasadena
George A. Wood, Loyola University

The evening was concluded with the showing of two fine color films: the Santa Fe Railroad's "Navajo Sand Painters," and the Southern Pacific Railroad's "Techachapi Earthquake Damage Repair." The latter picture revealed the terrific amount of damage done by Mother Nature in 28 seconds—the repair of which required 28 days of around-the-clock work.

—Harvey E. Rookus
Section Editor

The Second Annual Joint Meeting of the Northern and Southern California Sections of ACSM will be held on May 11, 12, and 13 at the Miramar Hotel in Santa Barbara, Calif.

The tentative program calls for the meeting to get under way Friday noon with registration and opening of exhibits by distributors of surveying and mapping equipment and supplies. Emphasis is being placed on active exhibits and demonstrations rather than fixed displays.

The high point of the meeting will be a talk by a noted California engineer on the Feather River Project, a plan to take water from Northern California to Southern California by a series of canals and tunnels.

Planned social activities include a cocktail hour and a dinner the first evening, a dinner dance the second evening, and on Sunday, an informal breakfast followed by a tour of the city, one of the show places of Southern California.

Surveyors' Workshop

The second annual Surveyors' Workshop was held at the Mission Ranch near Carmel, Calif., on October 1, 1955, with approximately 100 in attendance.

A panel discussion of the use of aerial photographs in surveying was a feature of the meeting. R. H. Moore, from the USGS office in Sacramento, served as moderator. The panel members were: C. O. Greenwood, Jr., a civil engineer from Sacramento; A. C. Hammon, photogrammetrist, Oakland; F. H. Moffit, professor of civil engineering, University of California; and R. S. Hogan, surveyor, Sebastopol.

C. J. Aggeler, instructor in surveying at the San Francisco City College, spoke on the need for more surveying courses in college and junior-college curriculums.

William C. Wattles, Glandale, Calif., discussed boundary problems resulting from the old Spanish grants.

The workshop voted to support a proposed change in state legislation which now exempts registered civil engineers from the need of a surveyor's license.

Colorado Section

The Colorado Section ACSM held its annual meeting on December 20, 1955, for the election of officers for 1956. Fifty-nine of the 79 ballots mailed to members of the Section were returned. The following were elected:

Chairman—Thomas A. Kelly, Professor and Head of the Civil Engineering Department, Colorado School of Mines.

Vice Chairman—Henry M. Townsend, U. S. Geological Survey.

Secretary-Treasurer—George M. Perham, U. S. Geological Survey.

Section Editor—William B. Upton, Jr., U. S. Geological Survey.

Before relinquishing the gavel to the new Chairman of the Section, J. E. Mundine summed up the work accomplished to date on the coming Regional Meeting to be held in Denver, Colo., September 30 and October 1 and 2, 1956. He stated that both parent organizations have approved the meeting; that, during a luncheon with Executive Secretary Walter S. Dix in Washington in December, he was assured of assistance in the mailing of the programs to the general membership; and that lots of moral support would be forthcoming from the National organization. Secretary Dix believes the affair will be a big success.

General Chairman for the fall convention, Stanley Borrell, announced that his slate of committee chairmen is nearly complete; that all 7,000 members of both organizations (ACSM and ASP) will receive cordial invitations to attend the meeting; and that each will receive programs of lectures, exhibits, and social get-togethers, well in advance of the convention date.

Watch the next issue of SURVEYING AND MAPPING for more facts concerning the Regional Convention.

—WILLIAM B. UPTON, JR.
Section Editor

Great Lakes Section

During the Fourth Annual Surveyors Conference and Meeting of the Indiana Society of Professional Land Surveyors, cosponsored by ISPLS and the School of Civil Engineering, at Purdue University, Lafayette, Ind., January 20–21, 1956, to which ACSM members from Indiana, Illinois, Michigan, Ohio, and Wisconsin were invited, ACSM President, Lester C. Higbee, presided over formalities which activated the Great Lake Section of the American Congress on Surveying and Mapping, appointing the following temporary Section Officers to prepare a constitution and conduct business until final organization and charter are effected and Section Officers elected:

Chairman, W. B. Williams, Grand Rapids, Mich.

Vice Chairman, Kenneth S. Curtis, Lafayette, Ind.

Secretary-Treasurer, George E. Ekblaw, Urbana, Ill.

Personals

Captain Philip C. Doran, Chief, Division of Geodesy, U. S. Coast and Geodetic Survey, and member of ACSM, retired from the Federal Service on January 31, 1956. On January 30th a large number of his associates and friends attended a luncheon in his honor. After more than 32 years service with the C&GS, Doran is undertaking an assignment involving the development of ground control for an extensive survey project in Australia.

Rear Admiral Robert W. Knox, Assistant Director, U. S. Coast and Geodetic Survey, has received the Department of Commerce gold medal for "outstanding contributions" to the public service. Fourteen of the gold medals were presented at the Eighth Annual Awards Program on February 14, 1956, by Secretary Weeks.

Dr. John J. Theobald, President of Queens College, recently appointed Deputy Mayor of the City of New York, will address the combined assemblies of the 1956 ACSM-ASP Consecutive Meetings, Wednesday, March 21, 1956.

From the *Journal, Florida Engineering Society* for October 1955, we learn that ACSM member Thomas L. Bransford is Secretary of the Florida Engineering Society and also editor of their Journal. The Secretary's office was established, as of last fall, in the new Testing laboratory of the State Road Department in Gainesville, Fla.

The appointment of Rear Admiral H. Arnold Karo as Director, U. S. Coast and Geodetic Survey, for a four-year term was confirmed by the Senate on February 10, 1956. The oath of Office was administered by Under Secretary Walter Williams of the Department of Commerce at a ceremony in the Department of Commerce Auditorium at 3:30 p.m. February 24, 1956.

₹ ₹ ₹

Radius of Sharp Curve

A quick and reasonably accurate method of determining the radius of an existing circular curve, such as a rounded curb-corner, has been suggested by Robert B. Irwin, of Los Angeles. In the accompanying diagram *A*, *D*, and *C* are points on the curve; *DE* is the diameter of the circle passing through the midpoint of the chord *AC;* and, since *DE* is the perpendicular to *AC*, *DB* is the middle ordinate of the curve from *A* to *C*.

If we let $DB = m$, and $BE = y$, we find from "similar triangles" that

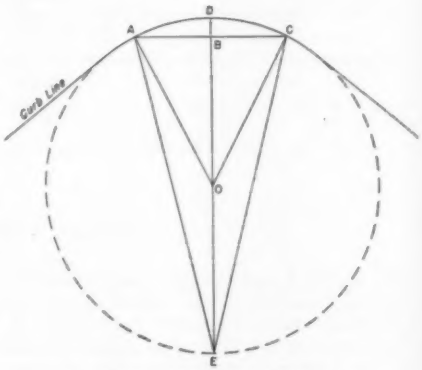
$$y = (BC)^2/m$$

and, if we let *DO* (the radius of the curve) $= R$, then

$$R = (m + y)/2$$

For example: Assume a 20-foot chord is defined on the ground by stretching a tape across the curve and that the middle ordinate measures 2.07 feet. Then

$$y = 100/2.07 = 48.31 \text{ feet, and}$$



$$R = (2.07 + 48.31)/2 = 25.19 \text{ feet.}$$

An error of 0.01 foot in the measurement of the middle ordinate, under the assumed conditions, causes an error of about 0.1 foot in the resulting radius. Even so, it is accurate enough for plotting the curve on even a large-scale map.

Annual Financial Statement

(As of December 31, 1955)

INCOME

Dues and memberships received ...	*1954*	*1955*	*Year ending 12/31/54*	*Year ending 12/31/55*	*Difference*
Individual	3,248	3,528	$16,357.01	$17,801.40	+$ 1,444.39
Library	266	304	1,198.00	1,398.00	+ 200.00
Sustaining	21	18	620.00	550.00	– *70.00*
Previous year's dues			248.00	199.00	– *49.00*
Total	3,535	3,850			
Total gross regular income			$18,423.01	$19,948.40	+$ 1,525.39
Deduct membership costs			*– 1,433.35*	*– 1,611.80*	– *178.45*
Net regular income			16,989.66	18,336.60	+ 1,346.94
Publication sales			404.94	341.74	– *63.20*
Advertising			2,908.66	3,713.53	+ 804.87
Annual meeting and other income			3,223.07	6,177.84	+ 2,954.77
OPERATING INCOME			$23,526.33	$28,569.71	+$ 5,043.38

EXPENDITURES

Journal (all expenses)	$13,628.69	$13,858.84	+$ 230.15
Other printing	0.00	0.00	0.00
Office supplies and Secretary's and Treasurer's expenses	1,117.98	952.91	– *165.07*
Technical Divisions	76.89	284.54	+ 207.65
Other expenditures authorized by the Board of Direction	112.22	0.00	– *112.22*
TOTAL EXPENDITURES	$14,935.78	$15,096.29	+$ 160.51
NET INCOME	**$ 8,590.55**	**$13,473.42**	**+$ 4,882.87**

ASSETS

Bank balance	$ 749.13	$ 5,459.70	+$ 4,710.57
Bonds and Savings Account	23,831.43	31,381.55	+ 7,550.12
Journal (back issues—estimated)	300.00	300.00	0.00
Advance payment	3.95	623.28	+ 619.33
Accounts receivable	1,182.54	1,399.79	+ 217.25
TOTAL ASSETS	$26,067.05	$39,164.32	+$13,097.27

LIABILITIES AND NET WORTH

Advance dues paid	$ 1,563.15	$ 1,187.00	–$ *376.15*
Exhibit space	0.00	0.00	0.00
Other accounts payable	0.00	0.00	0.00
TOTAL LIABILITIES	$ 1,563.15	$ 1,187.00	–$ *376.15*
NET WORTH	**$24,503.90**	**$37,977.32**	**+$13,473.42**

JOHN M. AMSTADT, *Chairman*
Budget and Finance

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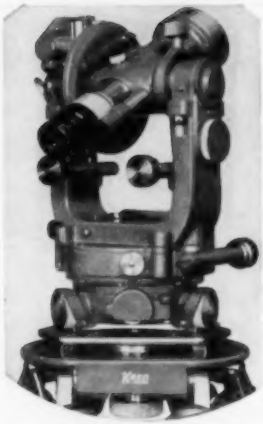

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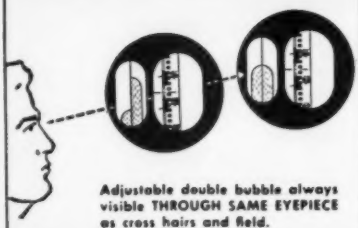

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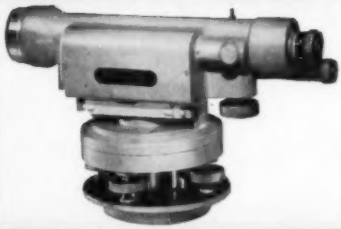

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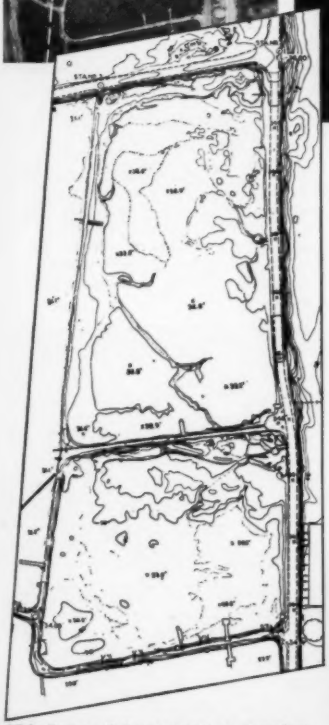

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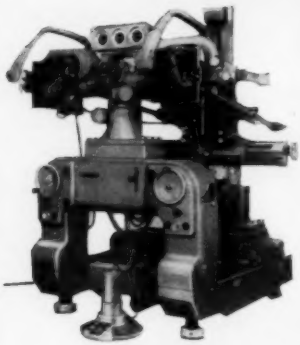

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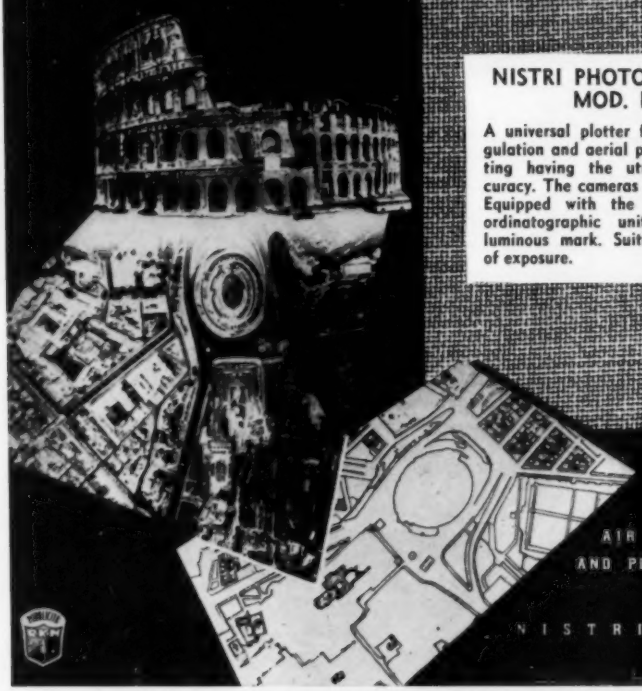

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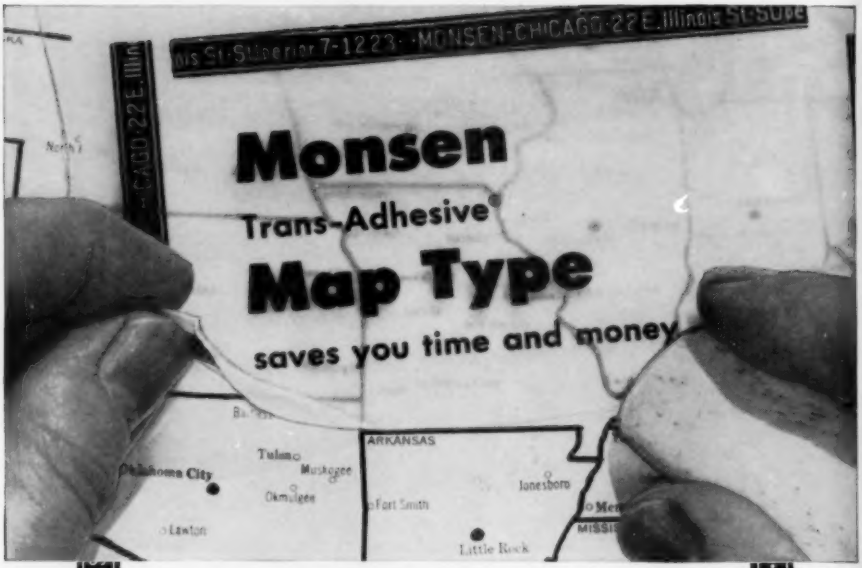

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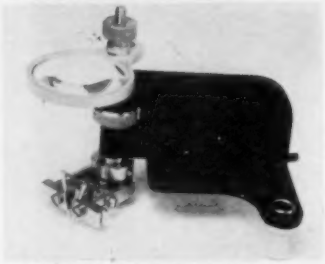

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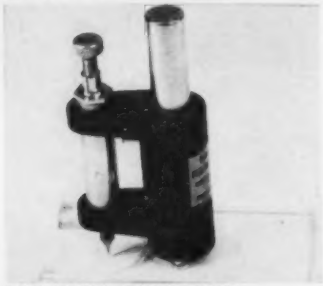

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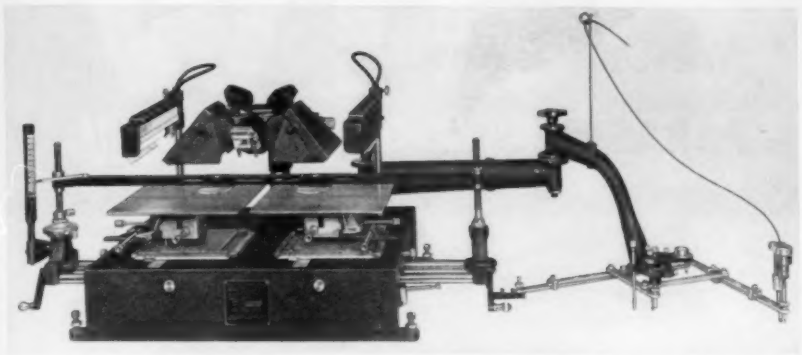

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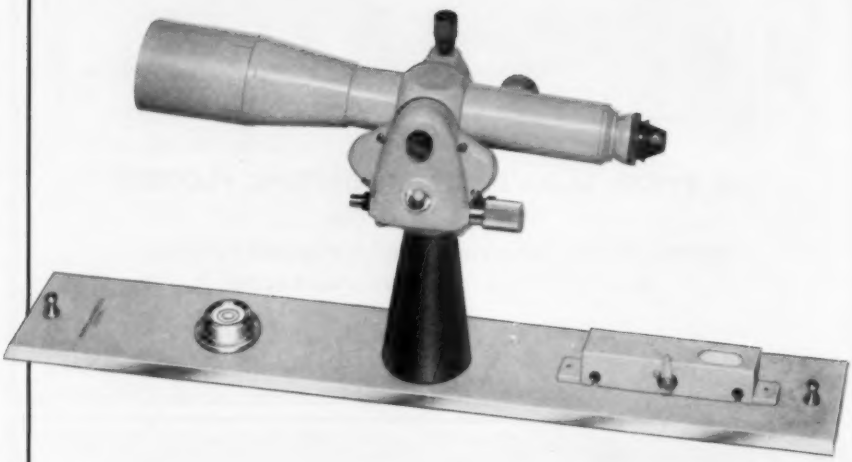

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